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THE BEGINNING OF CHRISTIANITY.

By Richard A. Proctor.

IN the following summary of facts and expression of opinion I reply to the question addressed me, as mentioned under "Gossip" in the last number of KNOWLEDGE, by a courteous clerical correspondent:—

First, it is simply a fact (be the explanation what it may) that not one of those writers, and notably neither Josephus nor Philo—who might have been expected to record many of the most remarkable events associated with the life of Jesus the Christ (or Anointed) in the Gospels according to Matthew, Mark, Luke, and John—make any mention of those events, though several were such as belong to the domain of history. Accepting even all the passages which have long been recognised as interpolations (some of them of the clumsiest sort), this remains true. Nay, if such passages are accepted, the difficulty is considerably increased.

Secondly, it is simply a fact (be the explanation what it may) that in the two sections of the New Testament which have been shown to have been really written by those whose names are associated with them, viz., the four unmistakably genuine letters of Paul (who had never met Jesus) and the Book of Revelations by John, "the servant of Jesus" (who knew Jesus well, and shows himself strongly—one might almost say fiercely—anti-Pauline), we find scarcely any reference to the details of the life of Jesus Christ. The resurrection is the only point insisted upon by Paul; and, strangely enough, he insists on it in such a tone as to imply that in his time not only the general doctrine of the resurrection of the dead, but the resurrection of Jesus, was disputed by many even in the Christian community. (Paul's anxiety on this point is remarkable, be the explanation what it may.) No light falls on our problem from this quarter. Nor are we helped if we regard all the epistles attributed to Paul as really his, rejecting decisive evidence that some among them cannot have been written by the great apostle of the Gentiles.

Thirdly, it is simply a fact (be the explanation what it may) that all those more remarkable details associated, long after even the fall of Jerusalem, with the history of Jesus the Christ, for mention of which we vainly look in the pages of contemporary writers, are found in the records of solar heroes, or of men to whom, long after their death, the characteristics of the sun-god were attributed—generally among nations who had long since given up, or had even absolutely forgotten, their old sun-worshipping religion. This is true of every such detail, from the Annunciation to the Ascension.

Fourthly, it is simply a fact (be the explanation what it may) that all the miracles described in the New Testament are such as had in old times been always regarded as specially solar. Because the sun brings light, it had been taught that the sun-god causes the blind to see; because the sun restores winter's dead to life, the sun-god raises the dead; because the sun restores sickly and diseased vegetation to health, the sun-god heals the sick; because the sun turns the waters which fall on the earth into the rich juice of the vine, the sun-god turns water into wine; because the sun causes the seeds which fall on the earth to bear fruit, thirty, sixty, and even a hundredfold, therefore the sun-god feeds the world richly out of little; because the sun kills feeble vegetation, the sun-god blasts the barren tree; because the sun rises above the sea-horizon, the sun-god walks upon the water; and because as the sun reappears after the darkness of storm, calm presently is restored, the sun-god stills the tempest.

Fifthly, it is simply a fact (be the explanation what it may) that all the festivals eventually adopted, both in the Eastern and Western Church, are not only related to astronomical events, but still constantly regulated by them—the movable festivals mostly depending on the equinoxes and the moon, while the fixed festivals are associated with the solstices. One might add such peculiarities as the twelve apostles, who like the twelve patriarchs (unmistakably), and the twelve apostles of Gautama, suggest a manifest association with the twelve zodiacal signs or solar months; while the seventy disciples of Christ, like the seventy disciples of Gautama, and divers others sets of seventy, suggest a kindred association with the ancient lunar year of five times seventy days. But the determination of Christian, as of Jewish, Mohammedan, and Buddhist festivals and fasts by the critical phases of the sun and moon, is the fact of profoundest significance.

Sixthly, it is simply a fact (be the explanation what it may) that the natural events related in the four Gospels which were retained (when two score and more were rejected), are in nearly every case found to correspond strangely with events referred to or fully related as actual facts in the writings of Josephus and others; but as facts belonging to the histories of several different persons, not one of whom can be identified with Jesus the Anointed Teacher, though several of them bore the (then common) name of Jesus. Even so strange a circumstance as the crucifying of three persons, of whom two died but the third was restored to life, actually happened to the knowledge of Josephus, who describes the event in the most natural and touching manner, but it happened long after the time of Pontius Pilate, and the three who were crucified were Josephus's personal friends. Indeed, so far as this personal experience was concerned, the historical Josephus of the family of Asamoneus may be said in this story to have filled the part filled in the other by Josephus of Arimathea. Even more perplexing is the reference by Josephus to a man named Zacharias son of Baruch (who was a sort of prophet, inasmuch as "he went over," Josephus tells us, "all the transgressions of the people against the law, and made many lamentations upon the confusion to which they had brought public affairs"), whom the people slew "in the middle of the temple." This happened about thirty years after Pontius Pilate was recalled to Rome—according to Josephus, for condemning to death a man who had led the people out to Mount Gerizim under false pretences, and whose record in this and other respects is quite unlike the history of Jesus, the Anointed Teacher of the Gospels. The strangeness of the story lies in its odd agreement with the reference made by Jesus (according to a much later account than Josephus's) to a prophet (described as *the last* of those slain by the Jews) whom Jesus—according

to this account—calls Zacharias, son of Barachias, and "whom," he says, "ye slew between the temple and the altar." Zechariah prophesied five centuries before, and has been apparently mixed up by the narrator (six centuries after the prophet's time) both with a much earlier Zechariah the son of Jehoiada, who was stoned about 840 years before Christ, at the command of King Joash, "in the court of the house of the Lord" (2 Chronicles xxiv. 20–22), and with Zacharias, the son of Baruch, who was slain in the midst of the temple, as related by Josephus, about a third of a century after the death of Jesus the Christ, according to the Gospel record.

Seventhly, it is a simple fact (be the explanation what it may) that the teachings in the New Testament, not only in their ethical aspect, but in method, and often in actual wording, are such as Gautama and his disciples preached long before, and as holy Aryans had taught long before Gautama. Max Müller dwells on the "strange coincidences" which there are "between the language of the Buddha and his disciples and the language of Christ and his apostles. Even," he proceeds, "some of the Buddhist legends and parables sound as if taken from the New Testament, though we know that many of them existed before the Christian era," which is Prof. Müller's quaintly cautious way of saying that the New Testament stories read as if derived from those earlier legends. There is not one of the teachings regarded as most characteristic of Christianity which is not more ancient than Christianity by many hundreds of years, albeit to the Jewish people those teachings were new, as they were also to those Western Gentiles whom the early apostles of Christianity chiefly taught. We cannot explain this by suggesting simply that Jesus Christ was an Essene, though it seems tolerably clear that he had been trained by teachers belonging to that sect; or by suggesting, further, that the Essenes had received their doctrines from Buddhist teachers, though there is strong evidence that they had. There was more in the teaching of Jesus, as there was more in the teaching of Paul, than either had derived directly from the earlier leaders of the Essenes; and in the doctrines of the Essenes there were details which had not been derived from Buddhist missionaries, either directly or indirectly—details which belonged to the Semitic character, and without which no doctrines of purely Aryan origin could ever have found favour among the Jews. Moreover, moral teachings must ever be expected to grow purer and better as the human race advances, insomuch that we can never hope to account for the full value of the best teachings of one age by referring them to the departed teachers of a less advanced one.

Such being the facts to which I have adverted with greater or less fulness in these pages during the last twelve months, I am asked what I myself believe in regard to them, and how I explain the difficulties which to many they appear to suggest. What is really wanted of me, I fancy, is that I should mention what I do *not* believe—that I should say not what I accept, but what I reject. I prefer, however, to answer the question precisely as it is put. In fact, I must decline to do more, on the grounds both of inclination and of duty.

Here, then, are some of the conclusions I accept, and I imagine I shall find few Christian readers of these pages who do not agree with me in accepting the teachings thus suggested.

At any rate we can never go far wrong in adopting inferences which either result directly from ascertained facts, or are at least entirely consistent with them. I believe that early in the first century a teacher of great power, and of singularly earnest character, who was called Jesus, and early known as the Christ or the Anointed, arose among the Jews. I believe that this teacher, a man of pure and blameless life (whatever else, higher yet, he may have been) brought before that people more effectively than any before, the better part of the doctrines—obviously Aryan in origin (whatever Semitic colouring they may have acquired) by which the Essenes had long been distinguished from other sects. I believe that the other sects, and especially the Pharisees, offended both by the doctrines and by the success of this teacher, opposed Jesus and his disciples bitterly at every turn.

Among those who sought most zealously to check the progress of the Essenes, and in particular of the followers of Jesus, was Paul of Tarsus (by birth a Roman citizen), of the tribe of Benjamin, and belonging to the most rigid sect of the Pharisees. Educated in the learning of his day, for which, Strabo tells us, Tarsus was celebrated, Paul went to Jerusalem to study the laws and traditions of his people under Gamaliel, one of the most distinguished of the Rabbis. (His work in tent-making was simply carried out in pursuance of a Jewish custom, not with the intention of making such work his trade.) He was present when still a young man (according to the Pauline author of the Acts of the Apostles, written long after Paul's death) when Stephen was killed. As has often happened in such cases, his earnest and fiery zeal for institutions which he regarded as especially Jewish, was converted into a still more earnest and fiery zeal for the doctrines which he had helped to oppose, so soon as he recognised in the first place their inherent beauty and value, and in the second the integrity and devotion of those who accepted them. He not only became a believer in the "foreign" doctrines, but was moved to teach those doctrines to Gentile races. He had known of Jesus Christ as the chief teacher of the new doctrines, and now taught them himself in the name of Jesus, and as a follower of Him who though dead spoke now through him, and whose resurrection from the dead he taught as an essential part of the new doctrine.

Among the earlier Jewish apostles the views of Paul were strenuously opposed, and by none more zealously than by John, the only other contemporary of Jesus whose actual writings have reached us (unless we accept as genuine the Epistle of Jude, rendered doubtful by the reference to the Gospel of "Enoch, the seventh from Adam," a work with which Enoch had certainly nothing to do), which are quoted probably from Matthew's record. Matthew appears to have left a record in writing of the teachings of Christ. This Gospel appeared in all probability about thirty years after Matthew's death, which we may assume occurred near the year 70. The Gospel according to Matthew has an Ebionite and anti-Pauline tone, which the strongly Pauline Gospel "according to" Luke seems to have been intended to correct. The Gospel (really the second, though placed third) probably appeared about the year 115. In the Gospel "according to" Mark, probably produced about twenty years later, there seems to be an endeavour to reconcile the opposing doctrines. But by this time the Pauline views, on which in fact the establishment of Christianity essentially depended, were generally accepted.

The Gospel according to John cannot have been in existence A.D. 168; for, in the Quartodeciman controversy in that year, the authority of John was cited in direct contradiction to the doctrines which the fourth Gospel urgently maintains. Possibly the appearance of that Gospel very soon afterwards may be attributed to this circumstance.

With regard to the life of Jesus, it is certain that long after he had passed away events were narrated in regard to him such as—either by some strange coincidence or otherwise—were recorded by Josephus as having happened to other persons to his own knowledge, while another series of

events, mostly of a much more remarkable nature, were narrated in reference to Jesus Christ, which—either by some still more remarkable coincidence or otherwise—had been related thousands of years before about the sun-god, and afterwards (but still hundreds of years before the time of this great teacher) had been mistakenly attributed to a number of persons who had actually lived, though, as in his case, the accounts only appeared long after such persons had passed away.

So much I believe. Most of this, indeed, is simply a re-statement of facts. Be the significance of these facts what it may, they must be accepted by all who have any real faith (for only the fearful try to blind their eyes to facts). What I do *not* believe—it is not necessary for me to say.

The evidence appears to me decisive that, though the doctrines of Christianity reached the present Christian world from a Semitic source, they are of purely Aryan origin. But, though those doctrines were originally Aryan, they would never have made their way as they did among the races which now accept them had it not been, first, for the specific warmth of colour given them by Jewish teachers, and especially by Jesus and Paul (who were, indeed, the teachers of the Jews); and secondly, for the special circumstances which led to the dispersion of such teachers among non-Jewish races after the Fall of Jerusalem. In the spread of the doctrines of love and justice among races then about to take leading positions in the world, but then (as now) most prone to cruelty and wrong-doing, I recognise the greatest event of which human history bears record, and promise of the worthiest fruit. *But though the fields have long been ripening into harvest the full time for reaping has not yet come; we shall not live to see it, though some even in our day have discerned its fair fields and pleasant homesteads from the Pisgah they sadly and painfully have climbed.*

THE STORY OF CREATION.

A PLAIN ACCOUNT OF EVOLUTION.

BY EDWARD CLODD.

PART II.

CHAPTER II.—THE ORIGIN OF LIFE.

HE fascination which the question of the origin of life possesses is not lessened by the slow abrasion of the artificial lines which divide the living from the non-living. Round it, like planet tethered to sun by the invisible force of attraction, the mind of man revolves, unable to disentangle itself and escape into a larger orbit, whence the truer proportions of things may be seen; nor will the undue importance accorded to the living vanish until there is deepened within us that sense of the unbroken interrelation of all things to which science brings her "cloud of witnesses."

It is agreed that there was an "azoic" or lifeless period in the history of the earth—therefore that life had a beginning; and it is with the evidence as to continuity or gap between the azoic and the zoic epochs that the present chapter is concerned.

The azoic stage is evidenced by the primordial temperature of the globe, which, taking the present temperature of the sun as a fair standard of comparison, is computed to have been 14,000 times hotter than boiling water. Under such highly energetic conditions chemical combinations of the vaporous particles were impossible, and, *à fortiori*, vital combinations. But with the slow cooling consequent upon the continuous passage of the earth's molecular energy into space, the combining forces came into more and more active play, forming first the extremely simple and more stable compounds, as water; then the more complex and less stable, as salts; and so on in increasing complexity of material and unlikeness of structure. Obviously an enormous fall in the temperature took place before the superheated mass became cool enough to permit the formation of an outer crust, into the depressions of which, probably at first at the temperature of a dull red heat, the water fell as it was condensed from the vapours which, charged with vast quantities of unabsorbed elements, floated over it.

Thus far, in broad outline, the material foundation for the superstructure of life.

When and *how* did life have its beginning? The first part of the question can be disposed of briefly. We do not know. But we do know that life must be vastly earlier than any record of it.

As to the mode, let us approach the problem by treating of what is common to both the lifeless and the living. Now, in brief, there are no elements in the one which do not occur in the other. The most complex plant and animal, and the lowest living germ, so apparently devoid of structure that it can only by courtesy be called an organism, are made of materials derived, directly or indirectly, from earth and air and water. These materials are oxygen, carbon, hydrogen, nitrogen, with a little sulphur and phosphorus, and still fainter traces of other elements, combined in extreme and elusive complexity. Of the several elements entering into this subtle combination, carbon is probably the element to which the most prominent part is to be assigned. Its compounds are more numerous and important than those of all the other elements taken together, and it possesses the property of uniting in manifold relations both of number and weight. Combining with the foregoing elements, it gives rise to the stuff called protoplasm, a peculiar feature of which is that it is neither solid, liquid, nor gaseous, but semi-fluid, or of sticky consistence. It is from this "physical basis of life" that, by successive modifications, slow in their operations, the teeming variety of living things has been developed. These, as explained already, are made up of myriads of cells, each of which is a life centre, their combination being the sum total of the life of the organism. But the cell itself is an organisation formed from the formless protoplasm, marking the first stage in structure; and therefore the question as to the mode of origin of life narrows itself to the origin, not of complex organisms, nor of cells, but of protoplasm. Given the matter which composes it, and the play of forces and energies of which that matter is the vehicle, wherein lies the difference which gives as one result non-living substance, and as another result living substance? The answer obviously is *that the ingredients being the same, the difference must lie in the mixing.*

We are already familiar in the inorganic world with the existence of the same element in more than one form, but with different characteristics—*e.g.* of carbon, as diamond, graphite, and charcoal; the difference being doubtless due to molecular arrangement. Chemistry also reveals intimate likeness of materials in the compounds known as isomeric, in which the physical and chemical properties vary considerably. It has also manufactured organic compounds, as starch, urea, and alcohol, the production of which was once thought impossible; and if the experiments to produce the living out of the not-living by decoctions of hay and extracts of beef have failed, as we might expect they would, this failure can have no weight against the argument that we cannot think any limit to the possibilities of Nature's

XUM

subtle transmutations during the vast periods that the earth has been a possible abode of life. And is not the transmutation of the inorganic into the organic ceaselessly going on within the laboratory of the plant under the agency of chlorophyll?

The ultimate cause which, bringing certain lifeless bodies together, gives living matter as the result, is a profound mystery. But, although the living thing affects us much more nearly than lifeless stones and rain, it hides no profounder mystery than they. The "affinities," as in our ignorance we name them, which lock the elements into beautiful crystalline forms, are no whit less wonderful than the motions in matter through which the same elements manifest the phenomena of life. The origin of life is not a more stupendous problem to solve than the origin of water. Both protoplasm and water have properties that do not belong to the individual atoms which compose them, and the greater complexity of the living compound does not constitute a difference in kind, but only in degree. It does not seem, after all, such a far cry from the crystal to the amœba as from the amœba to Plato and Newton. The crystal and the amœba take their place as independent products of physical and chemical change, and cannot do other than obey the law of their development. The crystals of rock-salt, determined by the mutual action of the attractive and repellent poles of their atoms, dispose themselves as cubes; the crystals of snow as hexagons; of sulphur as rhomboids; and the protoplasmic atoms, obeying their polarities and charged with separating energies, dispose themselves "each after his kind." But whilst the crystal grows by accretion at the surface, although even this distinction has its rare exceptions, the cell grows by assimilation or intussusception, *i.e.* by inflowing of nutrition amongst all its parts. Speaking relatively, for nothing is absolutely motionless, the crystal is stable, irresponsive; the cell is plastic, unstable, responsive, adapting itself to the slightest variation; it "stoops to conquer," and so undergoes ceaseless modification by interaction with its ever-changing environment. Life involves delicacy of construction; hence the transient nature of the organic in contrast to the abiding nature of the inorganic. And, strange as it may seem, separation is life; integration is death. For life is due to the sun's radiant energy, which, setting up separative movements, enables the plant to convert, through its mysterious alchemy, the lifeless into the living, thus forming energetic compounds which are used, partly by the thrifty plant for its own vital needs, and largely by the spendthrift animal for its nutrition, to repair waste and maintain functions. Ultimately the energy thus derived from the sun directly by the plant, and indirectly by the animal, passes into space; and "the dust returns to the earth as it was."

Turning to mental phenomena, from its lowest manifestations in the simplest reflex action of the amœba and the sundew when touched, to its highest manifestations in consciousness or self-knowledge, we find the connection between it and the bodily movements a greater *crux* than the connection between the inorganic and the organic. We know that all the thoughts we think, and all the emotions we feel, involve a physical process; that is to say, they are accompanied by certain chemical changes, molecular vibrations in nerve-tissue, involving waste or large expenditure of energy, which is repaired by food. We know that the healthy working of the brain depends upon nourishment, upon abstinence from excess, upon freedom from injury. Starve or stun or stupefy a man, let palsy or paralysis afflict him, and the complex machinery is thrown out of gear. And we know that the larger the proportion of brain to body, and the more numerous and intricate the furrows and creases in the grey matter of the brain, the higher in the life-scale are the mental powers.

But the gulf between consciousness and the movements of the molecules of nerve-matter, measurable as these are, is impassable; we can follow the steps of the mechanical processes of nerve-changes till we reach the threshold across which things are known by us, and beyond that we cannot go. We can neither affirm nor deny; we can only confess ignorance. "If anyone says that consciousness cannot exist except in the relation of cause and effect with certain organic molecules, I must ask how he knows that; and if he says that it can, I must put the same question."* That is the impregnable position of physical science as defined by its greatest living expositor. "Soul is only known to us in a brain, but the special note of soul is that it is capable of existing without a brain, or after death."† That is the unverifiable assumption of dogmatic theology.

INDIAN MYTHS.

By "STELLA OCCIDENS."

DAWN.

"THE whole theogony and philosophy of the ancient world," says Max Müller, "centred in the Dawn, the mother of the bright gods, of the Sun in his various aspects of the morn, the day, the spring, herself the brilliant image and visage of immortality." We find this likewise in the mythology of the American Indian races. Michabo, Manabozho, and Hiawatha are names which mean the Great Light, Spirit of Dawn; and Michabo,‡ as he is sometimes called, means the Great White One. He dispels the darkness, and his weapons are thunder and lightning, according to the Dacotahs. He is supposed to have engaged in a desperate struggle with his father, the West Wind, to avenge the death of his mother. When he had succeeded in driving his opponent to the brink of the world, the West Wind cried out, "Hold, my son, you know my power, and that it is impossible to kill me!"

This struggle is supposed to represent the daily encounter between light and darkness that knows no end, both opponents being invincible. The same myth is related with regard to Hiawatha among the Iroquois, Manabozho and Missibizi among the Algonkins and Chippeways. All these names mean Dawn in the different dialects of these races.

A curious likeness to the story of Jonah can be traced in the account of the heroes Manabozho and Hiawatha. Whilst angling for Nahma, the King of Fishes, the monster suddenly darted upward,

> Opened his great jaws, and swallowed
> Both canoe and Hiawatha.
> Down into that darksome cavern
> Plunged the headlong Hiawatha,
> As a log on some black river
> Shoots and plunges down the rapids.

Hiawatha felt his way in the darkness, and pulled his canoe across Nahma's throat. After a great struggle, Hiawatha killed the great fish, and, with the assistance of the seagulls, who pecked an opening in the ribs of the monster, he was soon released from his dark prison.

* Professor Huxley on "Science and Morals," *Fortnightly Review*, December 1886.

† Principal Tulloch, "Modern Theories in Philosophy and Religion," p. 328.

‡ Brinton, "Myths of the New World," p. 179.

Here we see plainly in the first myth that Hiawatha is the Sun, who engages in a conflict with the West (the sunset region). He follows the West to the brink of the world (twilight), and is apparently devoured by some monster typical of night. Hiawatha does not reappear until the seagulls set him free, and the first light of dawn appears shining through the ribs of Nahma. He is at last released and driven ashore near his lodge in the east, where he reappears in all his glory and is proclaimed victorious over the night.

A myth not unlike the above is told among the Ojibways about the Little Monedo. The latter is swallowed by a great fish, and is cut out again by his sister.*

The Chippeway Indians believe that Michabo resides towards the east, and in the formula of the meda craft, when the winds are invoked to the medicine lodge, the east is summoned in his name. The door opens in that direction, and there, at the edge of the earth, where the sun rises, on the shore of the infinite ocean that surrounds the land, he has his house, and sends his luminaries forth on their daily journey.

According to an Algonkin legend, Michabo was one of four brothers, representing the north, south, east, and west. They are named respectively Wabun, Kabun, Kabibonokka, and Shawano.†

In Longfellow's "Hiawatha," these four winds are introduced. Mudjekeewis, after a great encounter with Mishe-Mowka, the Great Bear of the mountains, overcomes him. The people proclaimed him "Father of the Winds of Heaven":—

> For himself he kept the West Wind,
> Gave the others to his children;
> Unto Wabun gave the East Wind.
> . . . . . .
> Young and beautiful was Wabun,
> He it was who brought the morning,
> He it was whose silver arrows
> Chased the dark o'er hill and valley;
> He it was whose cheeks were painted
> With the brightest streaks of crimson,
> And whose voice awoke the village,
> Called the deer and called the hunter.

He felt lonely in the sky, "though the birds sang gaily to him." But, gazing earthward, he perceived a lovely maiden. He wooed her with his smile of sunshine, and, folding her in his robes of crimson, changed her into a star—

> And for ever in the heavens
> They are seen together walking—
> Wabun and the Wabun-Annung,
> Wabun and the Star of Morning.

Captain Argoll, who visited the Potomac in 1610, heard the following from a chief:—"We have five gods in all. Our chief god appears often unto us in the form of a mighty hare" (compare with the Michabo myth); "the other four have no visible shape, but are, indeed, the four winds which keep the four corners of the earth."‡

In the Iroquois traditions the four winds were imprisoned by their Lord in the cave, or "Lodgings of Dawn." This recalls the account given of the Latmian Cave, or "Cave of Night," in which Endymion (the sun) was supposed to sleep at night.* The Thlinket tribes in their traditions and myths "mention two heroes or gods, who existed" at the beginning of time, and procured for mankind all the advantages they now enjoy. The names of these beings or demi-gods were Yeshl or Yehl, the ancestor of the Raven clan, and Khenookh, the ancestor of the Wolf family.†

Yeshl was the creator of all beings and things, and gave the sun, moon, and stars their places. His dwelling-place is nearest where the east wind blows (called by the Thlinkets "Ssannakke"). The Thlinkets imagine this place to be at the source of the River Nass, which enters the sea near the British boundary. The traditions are "that there was a time when the world was not, and man lived in the dark. A Thlinket had a wife and sister, and he loved them so much that he would not let them work. He let his wife sit the whole long day in the cabin, or outside upon a little hill. She always had eight little birds about her with a bright red colour, and if she spoke with any other Thlinket the birds flew away and informed the husband." He became so jealous, "that every time he went to the woods to build canoes—in which art he was a great master—he placed his wife in a box, locking the same."‡

Probably the husband in this story is the sun, and his wife the dawn. He leaves home in the morning, and in the bright light of the sun the dawn disappears; or, according to the Thlinket myth, remains in her cabin at rest. At evening the gorgeous rays of sunset are seen reaching across the sky towards the sun, and these are the eight birds, or messengers, who are bidding the husband, or sun, to hasten home.

The Stakkin Thlinket tells a different story. At one time the sun, moon, and stars were concealed in three separate boxes, by a rich and powerful chief, who guarded his treasures so well that nobody could touch them. Yeshl heard of this, and determined to get them. By a series of devices he obtained the boxes which contained the moon and the stars, and set the latter in the sky. He could not obtain the sun so easily, but, transforming himself into a raven, he flew away to the sky. On the way he heard human voices, but could not see the people, because there was no light on earth. He asked the people to tell him where to place the light, but they said:—"You will only cheat us—you are not Yeshl, who alone can give us light." In order to convince the doubters, Yeshl raised the lid of the box, and at once the sun shone from the heavens in all its splendour.§

Here we see that Yeshl is the dawn, who releases the sun from night; the box represents his imprisonment in the darkness.

Among the Iroquois traditions an account is given by Father Brebeuf, a Jesuit missionary, who resided among the Hurons in 1626, of Ioskeha and Tawiscara—meaning the White One and Dark One, in the Oneida dialect. The brothers quarrel, and the White One, or Ioskeha, conquering his brother, returned to his grandmother, and "established his lodge in the far east, on the borders of the great ocean, whence the sun comes." In time he became the father of mankind, and guardian of the Iroquois.‖

In the Algonkin legends of New England the account of Glooskap closely resembles the above. Glooskap engages in a terrible conflict with his twin-brother Malsumis or Wolf. "He sought him in the deep dark forest and smote him, so

* A tradition exists among the inhabitants of Melanesia, according to which their god Qat tries to get Night for the people, who had tired of perpetual day. He sent fowls to bring the Dawn, after the departure of Night should make it necessary. Next day the Sun crawled away west, and Night came creeping up from the sea. "This is Night," said Qat. "Sit down, and, when you feel something in your eyes, lie down and keep quiet." So they went to sleep. When night had lasted long enough, Qat took a piece of red obsidian, and *cut the darkness*, and the Dawn came out (Prof. Fiske, "Custom and Myth," p. 56). So that the idea of cutting darkness is not peculiar to the Indian mythology.

† Brinton, "Myths of the New World," p. 161. ‡ *Ibid.*

* "Chips from a German Workshop." Max Müller. Vol. II., p. 85.

† "Report of the Population, Industries, and Resources of Alaska," p. 166. By Ivan Petroff. Published at Washington, 1884.

‡ *Ibid.* p. 172.

§ "Reports of Alaska," p. 173. 1884.

‖ Brinton, "Myths of the New World," p. 184.

XUM

that he fell down dead."* This is again the victory of day over night.

According to a Passamaquoddy myth, "Glooskap was born in the land of the Wabanaki, which is nearest to the sunrise," where he now dwells. Another story relates that he came over the sea in a great stone canoe, and that the canoe was an island of granite covered with trees. "When the great man, of all men and beasts chief ruler, who had come down from this ark, he went among the Wabanaki." The Indian-English of the above is rather obscurely expressed in the following words: "Gloosecap hat left from ark, come crosse even wiht wabnocelel."†

COAL.

By W. MATTIEU WILLIAMS.

SUPPOSING all the difficulties of sinking described in my preceding papers have been overcome and the seam of coal is reached, the work of sinking is not yet quite finished. The shaft has to be continued downwards through the seam itself, and a few yards below that. This latter extension is to obtain a "sumpf," or "sump," *i.e.*, a well or tank for receiving the water which makes its way through the sides of the shaft, and will afterwards flow from the workings. Until the works are fairly opened, it is usual to draw the water from this by means of a large iron bucket with a hole in the bottom, which hole is plugged by a valve that lifts when the bucket is immersed in the water and closes the hole by its own weight, and the pressure of water above when the bucket rises above the level of the water in the sumpf.

The contrivance for emptying this large bucket when it is drawn to the surface is simple and ingenious. Instead of tilting it over (it is commonly 5 or 6 feet deep and a yard across), the plug valve has an iron pin attached to its lower part, and projecting like a short tail below the bottom of the bucket. The bucket is drawn up and raised a little above the surface of the ground, then a wide wooden trough is slid under it, and the bucket is lowered so that the pin strikes the bottom of the trough, thereby lifting the valve and allowing the water to flow from the bucket into the trough, which conveys it to the waste-water channel. When the roads are made and the pit is in full work a pumping-engine is erected for raising the water, a work which in some cases is very costly.

As already explained, the pit is usually sunk at the lowest part of the seam included in the "royalty" or area to be worked from it, but for reasons that will be readily understood, the working of the coal is not commenced here. In the first place, if the coal were removed from immediately around the shaft the ground would give way, and the shaft itself become a ruin. Besides this the roads required to reach the distant parts of the coal, and to bring it from them to the pit would be liable to extinction by burial. Therefore, the usual mode of proceeding is to begin at the outer or furthermost boundary of the royalty, and work backwards towards the shaft.

In order to reach this outermost portion drifts must be cut to serve as roads for bringing the coal to the shafts, and as channels for the water and ventilation. These are kept sufficiently narrow in the immediate vicinity of the shaft to leave a substantial mass of coal around to serve as a "shaft pillar."

In some exceptional cases (as when an extension of the royalty has been obtained after sinking the shaft) it is desirable to work some of the coal on the deep side of its incline from the shaft. The shaft itself is then sunk below the extreme depth of the coal to be won, and a cross cut made from it, entering the seam at a right angle or thereabouts, so as to effect its drainage. Then the roads to this portion of the pit descend from the shaft, and the coal has to be drawn up them by engine power.

I need scarcely add that the roads of a coal mine are very narrow-gauge railways. They are, in fact, the parents of all railways, this form of iron road having been first used in coal pits, and used there long before they came into practical operation above ground. The iron rails were preceded by wooden rails. The main road of a colliery is called a "mother gate" by old colliers. This word "gate" is used underground according to its ancient Scandinavian signification. *Gata* is the old Norsk or Icelandic for a way or road. *Gat* in modern Norsk and Danish means an inlet or opening. Our colliers in this, as in many other instances, still speak the tongue of Thor, the hammer-bearing god of the primitive miners; have deviated even less than the modern Scandinavians themselves. A gate in subterranean English is not the thing which bars the way, but is the way itself. Similarly the Northern expression "gang your ain gate" means go your own way, not your own *gait*, as commonly supposed.

In driving a gate or road, whether horizontal or more or less inclined, the same difficulty is encountered as in sinking a single shaft. The air gradually becomes worse and worse as the driving proceeds, until at last special contrivances for ventilation become necessary. Either the drift must be divided by a contrivance similar to the brattice of a shaft, or two parallel ways must be driven. The latter is usual, a rib of 6 to 10 yards thickness being left between them. The lower of these serves as the drain or "water gate," the upper is the main road for men and waggons or the "way gate." The side roads from the workings and the way-gate are called "bord-gates."

Where the seam is thick enough these drifts are made between the *thill* or floor (Icelandic again, *thilja*) of the coal and its roof. If the seam is above 6 or 8 feet thick, some of the coal may be left above to form the roof. If, on the other hand, the seam is too thin, the rock above the coal or the floor below is cut away to give sufficient height. The width of such ways is economised as much as possible, as every increase of width increases the dangers of falling roof and "creeping."

This creeping is very curious and instructive. I recommend it especially to the attention of those mathematicians who have gone a very long way from home in order to determine the rigidity or viscosity of the earth's crust, and whose very recondite calculations have so curiously contradicted each other. As Sir William Dawson told us at the last meeting of the British Association, "Hopkins, Mallet, Sir William Thomson, and Professor G. H. Darwin maintain the solidity and rigidity of the earth on astronomical grounds, but different conclusions have been reached by Hennesey, Delaunay, and Airy." Sir W. Thomson especially contends that a great amount of rigidity is indicated by the gravitation of the equatorial protuberance of the earth upon the moon, and the moon upon the equatorial protuberance.

A study of the phenomena of creeping would, I think, supply more reliable results as regards the viscosity of the outer crust of the earth, and show that its rigidity is overcome by a pressure which, cosmically regarded, is very small indeed.

This creeping is a gradual rising of the apparently solid rock floor after the coal is removed from a considerable area.

* Leland, "Algonquin Myths of New England," p. 17.
† *Ibid.* p. 29.

Not only does the roof crush down, but the floor bends upwards, owing to the transmission of the pressure of the superincumbent rocks in all directions—that transmission of pressure which constitutes the essential characteristic of fluids. This occurs more or less everywhere, and in old abandoned deep workings the roof and the floor ultimately meet, unless the air or water confined between them is unable to escape. Great permanent subterranean cavities at considerable depths are, I maintain, impossible. As will be seen presently, when I come to the methods of working out the coal, this impossibility has caused us to leave behind hundreds of millions of tons of good coal in our old mines, to be hopelessly buried beyond human reach.

Five to ten feet is the ordinary width of main roads or way-gates. Even this moderate width requires artificial support by means of poles or logs of oak or larch, commonly grown for the purpose in mining districts. These are cut to lengths respectively corresponding to the height and width of the road, two to height for each one for width. They vary from four to eight or ten inches in thickness. The two that are as long as the height are placed upright against the walls opposite to each other; the one matching the width of the road is laid across these as a cap or head-piece. This is continued at intervals of three or four feet in ordinary rock, but when the roof is friable, *i.e.*, liable to crack off in scales as the down-bending proceeds, it is further protected by planks laid from one cap-piece to the other. The expense of this timbering is a serious item in ordinary colliery operations.

In some cases the main roads are arched with brick or stone, like railway tunnels, and even built with an invert arch below to prevent the rising of the floor.

If the creeping or yielding to pressure were such as occurs when homogeneous material, such as metal, is thus forced to yield, no serious mischief would result; a mere bulging might be temporarily remedied by renewed excavation, but the structure of coal and the other rocks of the coal measures being either laminated or stratified, the bending produces superficial disintegration or chipping off in flakes, which too often are of sufficient magnitude to maim, and even crush to death, the man who is working below.

Outsiders hear of the wholesale catastrophes where by explosion of firedamp, or by the wrecking of a shaft, or by the breaking into water accumulated in old neighbouring workings, &c., many men are killed at once; but the far more serious danger to the coal-miner than any or all of these, that of falling roof, is rarely heard of beyond the immediate neighbourhood of the pits. The reason is simply that killing and wounding from this latter cause happens to only one man at the time. But the sum total of these isolated cases, as shown by general statistics, tells a different tale from that of occasional newspaper reports.

In 1883 the loss of life from explosions in coal mines amounted to 134; deaths in shafts, 97; at surface, 108; miscellaneous underground, 246; falls of roof and coal, 469—total, 1,054. Thus in this year falls of roof and coal killed three and a half times as many as explosions. In certain years, when one or two great explosions have occurred, the numbers killed by explosions reach or exceed those killed by falling roof, but generally speaking the fatalities from falling roofs amount to about double the number due to explosions. The numbers wounded, in many cases permanently crippled, by falling roofs is far greater than those killed, as may be readily supposed. Of these we hear little or nothing. It is not in the main roads, but in the side workings or "bord gates" where most of these sad accidents occur. Usually an explosion kills its victims with little or no suffering, the carbonic acid and carbonic oxide instantly resulting from the explosion are anæsthetic in their action, and produce nearly painless suffocation. The crushing accidents are of a peculiarly painful character.

EVOLUTION OF LANGUAGE.

By ADA S. BALLIN.

VI.—ROOTS AND THEIR DEVELOPMENT.

ACCUSTOMED as we are to the use of language in its present highly developed state, with all its complications, it becomes somewhat difficult for us to conceive a kind of language constructed of roots—words such as I described in my last; but such a conception is aided by observing how different languages run, as it were, on diverging lines, so that it may be possible, beginning, metaphorically speaking, at the most divergent points, to trace them up to the point of juncture. "Long before the age of Aryan separation the several relations in which a word might stand in a sentence had been clearly evolved, and certain terminations had been adopted and set apart to denote these relations. The creative epoch had passed, and the cases and numbers of the noun had entered on their period of decay. But with the verb it was quite otherwise. Here we can ascend to a time when, as yet, the Aryan verb did not exist—when, in fact, the primitive Aryan conception of a sentence was the same as that of the modern Dayak. Most verbs presuppose a noun, that is to say, their stems are identical with those of nouns."* For example, the Sanscrit *bharâvi-mi*, Greek *tithé-mi*, originally meant "bearing of me," "placing of me."

While the Aryan verb can thus be traced to a nominal form, the Semitic verb was originally, and still remains, a noun, whatever tenses and moods it has gained being of comparatively late origin, and expressing not time but relation, whereas the Aryan verb from the first moment of its existence expressed time. In Hebrew, for example, which may be taken as a type of Semitic tongues, the root, pure and simple, is used to denote the third person singular of the perfect, and the other persons are obtained by attaching affixes. The two so-called tenses, perfect and imperfect, are used interchangeably to express either past, present, or future. Thus Hebrew is a specimen of language composed of nouns. To take an opposite example, in Algonquin everything tends to verbal expression; adverbs and prepositions are regularly conjugated, and nouns are to a great extent verbal forms—for example, *house* is "where they live." The tendency of this language is to very long words, the longest in Elliott's Massachusetts Bible containing thirty-one letters and eleven syllables. It is *wut-appesitu-qussun-nooweht-unk-quoh*, literally, "he came to a state of rest upon his bended knees, doing reverence to him."—(J. H. Trumbull). The mere contemplation of it is overpowering, and we turn with relief to apparently simpler cases.

The Eastern division of Polynesian languages, which have alphabets containing not more than ten, and often as few as seven, consonants, their syllables being all open, composed of single vowels or of a vowel preceded by a single consonant, are polysyllabic, but have no inflections, expressing neither gender, number, place, mode, nor person. Their words are impartially used without any change, as verb, substantive, adjective, and even preposition. Their grammar is made up of pronouns, indicative participles, prepositions, and the like, and they possess nothing which can properly be called a verb. In this we approach to the Chinese type of language,

* Sayce, "Introd. Sc. of Lang.," vol. ii., p. 150. See what follows.

in which the word which is practically a root may be used indifferently as one and another part of speech. This type it is which, as I have said, approaches most nearly to what we may imagine to have been the primitive form of root-language.

More than two thousand years ago the Indian grammarians had discovered that all the words of their language could be traced back to certain phonetic forms, which they called "elements," and fierce controversy arose as to whether these "elements," or, as we call them, *roots*, were verbal or nominal, whether the noun or the verb was the older part of speech. But, as Sayce observed: "We must be careful not to fall into the mistake of the Indian grammarians and their modern followers, and confound these roots with verbs or any other of the constituents of living speech. The roots of language are like the roots of the tree with its stem and branches; the one implies the other, but all alike spring from the seed, which in language is the undeveloped sentence of primitive man, the aboriginal monad of speech." According to Sayce, roots "are the last result of linguistic analysis, the elements out of which the material of speech is formed, like the elementary substances of the chemist." *

When, however, I am in favour of the theory that the languages of various families may be reduced by analysis to one primitive form, namely, the root-word, I do not wish this to be understood as a defence of the hypothesis of the common origin of all languages; for, as I have said already, the universal similarity of physiological structure, as well as many of the phenomena of external nature, are sufficient to account for any resemblance which may exist between the tongues of widely-diverging races.

In his rambling work on the "Origins of Religions and Language," Canon Cook, supporting the theory of the primeval unity of language, gives a list of two hundred and fifty words, which he maintains are identical in form and meaning in Egyptian, Semitic, Aryan, and other families. The resemblances are certainly in many cases very striking, as the following instances will show; but it will also be observed that the majority of these words are imitative of natural sounds, a fact which Canon Cook seems to have overlooked. Thus in ancient Egyptian *aā* is an ass, and *mau* cat and lion; *chefer* (*ch* like χ), *scarabeus*, our *chafer*; Cymric, *cwyber* and *cwifio*, our *quiver*, *cwyf* meaning motion, stir, representing the sound of a body shooting through the air; Cornish *chuyvyan*, to escape; French *esquiver*; Old High German *chevor*, *cheviro* beetle; in Middle High German *kever*; Anglo-Saxon *ceafor*; Egyptian *refref*, a worm, *reptile*, Greek *erpeton*, from *erpo*, to creep; Sanscrit *srp* or *sarp*; Latin *serpo* and *repo*, imitative of sound produced by peculiar motion of snakes. Egyptian *amam*; Sanscrit *yam*; New Zealand *amu*, to eat, swallow, imitative of the sound of the closure of the lips after a mouthful has been taken. Egyptian *ang* or *ank*, to squeeze, embrace; Sanscrit *anhu-s*; Latin *ango*, to throttle, representative of the guttural sound produced by the person who is being throttled. Egyptian *pad* or *pat*, to flee; *pet-pet*, to cause to flee; Sanscrit *pat*, to flee, fall down; *pātao*, a fall or wing; *pattrin*, a bird, imitative of sound. Compare our *patter* of rain or footsteps. Egyptian *as*, swift; Sanscrit *açua*, a horse, indicative of the sound of rapid motion through air. Compare our word *swish*, also Egyptian *s-s*, or *s-m-s*, horse; Hebrew *sus*; African *so*, *samar*, *so-sa*, and *so-si*; *so-musa*, a mare. Egyptian χ*aru*, to wage war; Sanscrit *hāra*, war; *hr*, to seize violently, probably imitative of the rapid breathing of a man or animal when springing on an enemy or prey. Egyptian *purasha* and *parashu*, to hew; Sanscrit *paraçu*, an axe, sound of cutting through wood. Similarly, Egyptian *shad*, to cut; Sanscrit *cid* (representing ancient *kh* sound); Old Dravidian, *cut*; Zend *shenda*. Egyptian *sper*, wish, request; Sanscrit *sprh*, *sparh*, to desire; Latin *spero*; Old Norse *spir*, to ask, imitative of sound in breathing. Compare Latin *spiro*, I breathe; our *to aspire*, literally "to breathe after." In Hebrew the the ideas of wishing or desiring are expressed by several words, originally meaning to breathe—as, for instance, *ava*, and imitative of sounds produced in breathing. Egyptian *kerer*, to burn; Hebrew *charar* (χ), the sound of which word is very suggestive of the roaring sound of flames; Sanscrit *ghar*, to shine; *gharmes*, heat; Zend *gar*. Egyptian *asb*, *ūshbu*, to consume; Hebrew *ēsh*, fire; Sanscrit *ush*, to burn; *ushna*, hot; *ushra*, flash. Egyptian *shu*, sun or, with a different ideograph, light; Rig Veda *çuc*, shine, blaze; *çuki*, shining, flaming; *çush*, *çûshia*, the demon of drought; *çûshma*, flame; *çûshumi*, blazing; Basque *su*, fire, from the hissing sound of flames. Egyptian *ka*, *ga*, bull or ox; *kauī*, cows; Sanscrit and Zend *gō*, and Egyptian *behes*, Coptic *bahsī*, anciently Egyptian *ab*, calf. Compare Greek *bous*, bullock; ox, cow, are probably derived from sounds similar to those made by the animals. The word *mer* in Egyptian is used in three different senses, with different ideographs: it means—1, to die; Sanscrit *mṛ* or *mar*, *maras*, death; 2, to love; 3, the sea; Coptic *meire*, lake, inundation; Cornish *môr*, and Old Turanian *môr*, meaning the Caspian Sea. In the last sense it is imitative of the murmuring sound of waters.

More obscure, however, is the probable origin and relationship of the following words:—Egyptian *āka* or *āga*, to consume by heat; Hebrew *ach* (χ), oven; Sanscrit *agni*, fire; Egyptian *bā*, to shine brightly; Sanscrit *bhā*; Egyptian *rakhu*, to burn; Sanscrit *ruc*, Latin *lucere*; Egyptian *dam*, to subdue with violence; Sanscrit *dam*, Latin *domare*, the original meaning of which was probably to bind; Egyptian *kan*, to beat, conquer; Sanscrit *ćaṅ* or *kshaṅ*; Egyptian *kuk*, evening; *kak* or *kakiu*, darkness, night; Sanscrit *çâya* for *khâya*, Latin *cæcus*, blind; Accadian *gig* and *kug*, darkness; Finnish *gi*, night; in the Veda used in the sense to cover, *tamas asit tamasâ gûḍham*—"darkness was covered with darkness"; Egyptian *man*, *mēn*, to be steady, abide; Hebrew *amēn*, Sanscrit *man*, puto; Zend *upaman*, Latin *manere*, Greek *man*, verily, in truth, like Hebrew *amēn*, also Greek *mēn*; Egyptian *mâch*, measure, weigh, reflect; Sanscrit *māh*, to measure; Egyptian *māt*, truth, justice; Sanscrit, *mā*, measure.

It is not so easy in the latter instances to see the imitative origin which we may conjecture to lie at the root of the similarity in these words, but in inquiries such as the present we must not lose sight of the fact that words or signs (as I have shown when discussing the language of the deaf and dumb) at first distinctly imitative, after they have been adopted into language, and when there is no longer a risk of their being misunderstood, become conventionalised on the principle of economy of effort. And again, we must remember the powerful imagery of primitive minds, which, on the grounds of some resemblance not apparent to our more analytic brains, will transfer a word from one meaning to another; so that, to take a familiar example, the word *drum*, imitative of the sound of sticks or hands beating on parchment, is applied to the *drum* of the ear, the similarity in this case being the tightly stretched membrane, and having no reference to sound. It is necessary to make these observations, as the facts mentioned are persistently ignored by those who deny what I have called the "natural origin" of language, in order to ascribe it to the supernatural.

There can be little doubt that the earliest means by which

* *Loc. cit*, p. 3.

man sought to express his thought was, if I may so call it, pictorial. The untaught deaf and dumb, whose ideas are mainly of aspects and actions, as I have shown, express these ideas by gestures which are essentially representations, the young child adds to its expressive gestures sounds which are imitative, and which, being understood by the child's relations, become words, surviving until supplanted by words in ordinary usage. The language of the savage is to a great extent made up of gestures, and hence everything would lead us to believe that the primitive man, whose feelings, like our own, were instinctively expressed, would endeavour to represent his ideas, necessarily very crude, by illustrating them, as it were, representing aspects and actions of things by gestures, and sounds by sounds.

My friend Professor Sayce has observed "There was a time in the history of speech when the articulate or semi-articulate sounds uttered by primitive man were made the significant representatives of thought by the gestures with which they were accompanied, and this complex of sound and gesture—a complex in which the sound had no meaning apart from the gesture—was the earliest sentence."*

The Rev. J. L. Wilson, describing the Grebo language, says it has personal pronouns, but they are rarely used, and whether the verb is in the first or second person and so on is shown by gesture.

Fisher states that the Comanches and neighbouring tribes have "a language of signs by which all Indians and traders can understand one another; and they always make these signs when communicating among themselves."† James writes of the Kiawa-Kashaia Indians: "The nations, though constantly associating together and united under the influence of the Bear-Tooth, are yet totally ignorant of each other's language, insomuch that it was no uncommon occurrence to see two individuals of different nations sitting upon the ground and conversing freely by means of the language of signs. In the art of conveying their ideas they were thorough adepts, and their manual display was only interrupted at remote intervals by a smile or by the auxiliary of an articulated word of the language of the Crow Indians, which to a very limited extent passes current among them."‡

Now the manual sign language, used alike by the uneducated deaf mute and by the savage, is a pictorial language imitative of the aspects and n.tions of objects, and it is therefore easy to believe that in those who could hear and reproduce sounds vocal imitation would rank high as a means of communicating ideas. The human ear and vocal organs, and the mind which uses them, are and always have been much the same all the world over; and that the first words, wherever developed, were imitative words there is little room for doubt. This interesting subject I shall more fully discuss and illustrate in my next article.

A WHIST SUPERSTITION.

BY "FIVE OF CLUBS."

A CORRESPONDENT (G. B.) sends us the following amusing account of an episode at the whist-table, and of the appearance, alive and to some degree kicking, of a very old whist superstition, which we had supposed to be dead:—

"The other night, while playing whist with two very old packs of cards, misdeals were in consequence frequent. One of our adversaries, after a misdeal, offered a bet that some one in the next hand would hold a single card of some suit. My partner took the bet, but, most curiously, no less than four single cards appeared. Later on he offered two to one, after another misdeal, and won again. I had not heard of the superstition before, and, knowing that the appearance of single cards after dealing with one pack could not be affected by a misdeal with another pack, supposed it would arise from the fact that the odds in any deal whatever would be in favour of some player holding a single card. This idea was scouted; so I went into the question afterwards for my own satisfaction. I should be glad to know if my calculations are correct."

Our correspondent proceeds to calculate the chances in the following way:—He supposes a player to have a spade dealt him first, and calculates the chance that as the rest of that player's hand is dealt another spade will not be given him, finding it quite correctly. He then multiplies that chance by 4 for the several suits, which also is correct in principle. And then he multiplies the resulting chance yet again by 4 for the different hands, which is not correct; corresponding to the mistake of multiplying $\frac{1}{6}$, the chance of throwing "ace" with a die at one cast, by 6, to get the chance of throwing "ace" in six casts, getting 1 or certainty, which is certainly wrong.

But the fact is, our correspondent's result, 7 to 4 against a singleton appearing somewhere among the deals, is far from the truth. His method of calculation errs in this, that it deals only with the chance of there being a singleton in the suit from which the first card dealt to a hand may chance to come; whereas a singleton may show, and is, of course, more likely to show, in a suit which is *not* the first dealt to a hand.

The superstition in question is a very old one. It appears in Bohn's "Handbook of Games" in the following monstrous form:—

"The degree in which whist is arbitrarily affected by the cards may be gathered from the following fact (!):—After a misdeal, on dealing again with the same pack, one of the players will, *nine times out of ten* [the italics are very much ours], hold at most but one card of one of the four suits. How this comes to pass is a problem that remains to be solved; whether the fact be so or not is of very simple proof."

This, of course, outrages sense. Apart from the inherent absurdity of the superstition, we have the absurd statement that the fact can be readily tested. Now misdeals do not occur so often, nor have the results of deals *after* a misdeal been so commonly or so carefully noted that the supposed law can be readily or simply proved from any evidence collected in the past. Imagine a whist party or club undertaking to test the matter, wilful misdeals would of course not count, and what a set of duffers a whist party or club must be which could in any reasonable time provide the hundreds, nay the thousands, of real misdeals which would be necessary to submit the supposed law to adequate experimental test!

But the real chance of a singleton appearing in one or other of the hands, or in more than one, at any deal, is so much larger than most persons suppose that the birth and growth of a superstition of the kind can be readily understood, so many having no idea whatever in these as yet unscientific days of considering causation. Doubtless our correspondent's correct reasoning on this point was scouted by the holders of the fancy he rejected. Yet probably they were not weakminded fancies, which, for persons who considered causation would be to all intents and purposes idiotic, are merely the results of a kind of lazy thoughtlessness in those to whom the idea of causation is unfamiliar.

* Introd. Sc. of Lang., vol. i., p. 116.
† Trans. Eth. Soc. (1869), i., p. 283.
‡ "Expedition to the Rocky Mountains," iii, p. 52.

XUM

In reality, the odds at any deal are largely in favour of a singleton appearing in *some hand or other*. Even the chance of a singleton appearing in a *hand taken at random* is much larger than many suppose—no less, in fact, than 4–13 (that is, a player may expect 4 singletons in 13 hands). We leave the proof of this till next month, when we will give it as an exercise for the reader (the *data* will be found at page 196 of our "How to Play Whist").

MAP I.—THE NORTH POLAR REGIONS, ON THE EQUIDISTANT PROJECTION:
Being the First Map of the One-Scale Atlas.

ONE-SCALE ATLAS.

NORTH POLAR MAP.

MAP NO. I.—THE REGIONS AROUND THE NORTH POLE.

WANT of space prevents us from giving this month, as we had proposed, an account of the method of dividing the earth's surface into twelve exactly equal parts, for this atlas, and mapping each part, with convenient overlaps, on one uniform projection, in such sort that the scale is practically constant throughout. But we give the first map of the series, whose relation to the others can be recognised from the index maps in the November and December numbers of KNOWLEDGE.

THE NATURALIST'S LABORATORY.

CONTRIBUTION V.

THE floors of houses are usually made in this country of deal and other coniferous woods, which ought to be well water-seasoned; that is, the timber, before it is sawn up into planks, should be soaked in water until all decayable and soluble matters are removed; pure lignin is thus left behind, and when thoroughly and gradually dried affords a material which will not warp much upon the variations of temperature, nor emit foul exhalations. But, from the chemical nature of wood in an unprotected condition, it is apt to imbibe noxious gases, to store them, and to give them forth at sundry times, but more especially when the moisture of cleaning and swabbing is followed by an increase of temperature for drying purposes. This pollution goes on very gradually yet surely, and is a recognised fact amongst sanitarians, whose work has been chiefly directed to the construction of hospital wards, which require to be periodically renovated. With regard to ordinary dwelling-houses, Prof. Dr. Jaeger says*:—"My sister, resident in New York, has told me that one of the best-known German physicians in that city once remarked to her that no house ought to be inhabited for more than sixty years, but should then be pulled down, as it is infected by all the diseases of those who have ever dwelt there. He was right. Probably every reader has at some time or other, on entering an old house full of woodwork, been struck by the unwholesome smell. What is, then, to be done? My readers will scarcely reconcile themselves to the radical remedy suggested by the American physician, nor do I consider it necessary. If all plain wood were to be thoroughly oiled or varnished, I believe that old houses would no longer be haunted by such evil spirits."

M. Boulton's process of timber preserving is briefly summarised by J. A. Westwood-Oliver† as follows:—"He aims at removing the watery moisture in the timber present at the time of injecting coal-oil: while he accomplishes this without the resort to the excessive heat usually employed in drying timber, which he thinks cannot be heated beyond 230° F. with safety, as at a temperature much exceeding 250° F. the woody fibre begins to be decomposed, and the pyroligneous acids are distilled from it, warping and brittleness being also caused. His process is based on the difference between the boiling-point of water, 212° F., and the distillation-heat of creosote, which ranges from 350° F. to 750° F. By the old process the timber was placed in a cylinder from which the air and moisture were partially withdrawn by an air pump, and creosote heated to about 120° F. was introduced; the action of the pump was then discontinued, and pressure pumps employed to force the creosote into the wood. M. Boulton introduces the creosote at a heat slightly exceeding 212° F., and continues the action of the air-pump, thus drawing off the watery vapour, while the creosote is not vaporised. By this means wet wood can be introduced into the cylinder. The logs float on the creosote, which is heated as in a still, and the watery vapour passes through a condensing worm. Wood has been exhibited thoroughly good after thirty years' use. Fences and posts erected in 1855 and beech sleepers creosoted in 1856, with nineteen or twenty years' wear, are perfectly sound."

But timber prepared after this fashion is not even sparingly used for buildings as yet, so that it behoves the householder to turn his attention to ready expedients, and to convert existing defective floors into sound and sanitary structures. The upper floors of even some of the best mansions are made of very imperfectly matched planks, so that large interspaces permit of the entry of dust and dirt of the worst description, there to fester upon the slightest favourable occasion and pollute the dwelling. "Carefully covered floors, preferably lined with parquet, add to health; the flooring is preserved, it is cleanly, it is artistic. I may here mention an incident which was related to me by Mr. Howard, of the eminent firm of Messrs. Howard & Sons, Berners Street, Oxford Street, London, W. When Messrs. Howard were laying the floors of Westminster Hospital, they were first of all obliged to pull up the flooring in order to match the boards; they thus discovered over each joist little conical mounds of dust—the accumulated filth of many years. I have no doubt but that to these pigmy heaps is to be attributed much of the permanent contamination of fever and other wards where the cause of illness is due to specific germs, which find their way into these collections; and the septic dust thus established is kept under favourable conditions of warmth and moisture every time that the floors are washed and dried."* Although parquet flooring is necessarily expensive at first, it embraces many advantages of the greatest importance to the cleanly maintenance of the laboratory. The benefits to be derived from its adoption may be briefly summarised as follows:—(1) Freedom from accumulations of dust; (2) the ease with which it can be cleansed; (3) when washed with a wet cloth it does not absorb water; (4) it is beautiful and durable. But where the question of outlay interferes with the employment of parqueterie, the floor-boards ought to be accurately matched, or existing interspaces should be carefully caulked, as on the deck of a ship, not necessarily, however, with oakum and pitch, but with such inexpensive materials as are always at hand. Old newspapers boiled down in starch paste, with a small proportion of glue and a little corrosive sublimate, serve admirably. It may be applied in a plastic condition with an ordinary putty-knife; when dry, it does not shrink, but forms a hard, horny-textured substance. The floor thus prepared may be painted, bees-waxed, or covered with preservative material, and if desired, additionally provided with oil-cloth or linoleum. Carpets and rugs, as dust-harbourers, should never be used.

To polish the floor with bees'-wax the following formula may be adopted with success:—"To prepare wax for polishing floors, 12½ pounds of yellow wax, rasped, are stirred into a hot solution of 6 pounds of good pearl-ash in rain-water. Keeping the mixture well stirred while boiling, it is first quiet, but soon commences to froth; and, when the effervescence ceases, heat is stopped, and there are added to the mixture, while stirring, 6 pounds of dry yellow ochre. It may then be poured into tin cans or boxes, and hardens on cooling. When wanted for use, a pound of it is diffused in five pints of boiling hot water, and the mixture, well stirred, is applied while still hot to the floor by means of a paint-brush. It dries in a few hours, after which the floor is to be polished with a large floor-brush, and afterwards wiped

* This passage is quoted from a little volume entitled "Selections from Essays on Health-Culture, and the Sanitary Woollen System," by Dr. Gustav Jaeger, M.D., Stuttgart, p. 120. It has been ably translated and edited by L. Tomalin. The work is published by "Jaeger's Sanitary Woollen System Co., Limited," of 42 and 43 Fore Street, London, E.C., for one shilling. It ought to be carefully read, and should find a place in the library or bookshelf of every householder who values good health adequately.

† *The Illustrated Science Monthly*, London, October 1885, vol. iv., p. 29, *et sequentes*.

* "On Health in the House." A paper read at the Conference of the Society of Architects' Exhibition, London, March 5, 1885. By J. Ernest Ady. Vide *Building News*, London, March 6, 1885 vol. xlviii., p. 361.

XUM

with a coarse woollen cloth." It is said that a coat will last six months.*

Of preservative media, adapted to the floor of the laboratory, the two under-mentioned are worthy of trial:—1. "Mix together boiled linseed oil and finely powdered coal, to produce a substance of the consistency of paint. Apply a coat of this to the floor." 2. "A mixture is made in a metal pot of 40 parts of chalk, 50 resin, 4 linseed oil, and 1 part of native cuprous oxide. One part of sulphuric acid is cautiously stirred in. A sort of mastic results, which may be applied hot, and when dry forms a varnish hard as stone."†

In spite of every care, however, dust will creep into the laboratory, from our clothing, boots, the wear and tear of furniture and instruments, books, fireplaces, and lamps. But when all the precautions noted above are carefully observed, it will be found that occasional wiping with a rag leaves the room practically clean and comfortable; and the student will then be able to indulge in delicate dissecting with the microscope and elaborate mounting of objects, without any fear of danger from floating dirt, and with a rapidity which would be impossible under any other circumstances.

Under the name of the "Dust Inhaler," a very ingenious contrivance has been devised and patented by a Mr. Newton, whose specification is thus given:—"A horizontal fan suspended and revolved in a hollow cone over a tray of water, creating a partial vacuum in a small cylinder above the fan, from which, and connected to it, an elastic tube of any length, with a revolving hair or other brush at the end of the same, so that the brush loosens the dust, and the current of air entering the partially-exhausted tube carries the dust with it through the fan, and impinges on the surface of the water; the air then passes through perforations free of dust."‡ The apparatus is useful for sweeping floors, carpets, footpaths, &c.; to dust walls, curtains, and clothing; and, as it proceeds, collects the dust to deposit in the tray of water: hence its value in the laboratory cannot be over estimated.

LABORATORY FURNITURE.

The subject of laboratory furniture has received but a modicum of attention in this country, although our Continental neighbours, and especially the Germans, have made vast strides in this direction. The poor naturalist is not even so fortunate as his chemical brother in this respect, for whilst the latter can procure ready-made furniture suited to his requirements, the former is invariably compelled to make shift with what he can borrow from various quarters—the kitchen, bedroom, and other domestic sources—or is obliged to call in the aid of an architect or carpenter to design and produce articles upon the spur of the moment which are afterwards found to be wanting in many essential details when they come to be tested in the severe school of "mother experience." In this way it often happens that articles of the most heterogeneous assortment find their way into his sanctum, and give it more the character of a lumber-room than a well-regulated workshop; these remarks extended, it is to be deplored, are, with but slight modifications, equally applicable to biological and geological laboratories in even some of our modern universities and colleges. But chairs and tables, cupboards and book-shelves, &c., do not constitute the sum of all that is required for the adequate equipment of the apartment; there are also reagent stands and bottles of suitable shapes and sizes; vats and jars for decayable specimens; boxes and cabinets for minerals, rocks, and dry materials; aquaria for plants and animals; a hot and cold-water supply; and rational wearing apparel for the worker; all of which call for description in this place rather than amongst the instruments that are directly employed by the student to assist him in his researches.

* *The Illustrated Science Monthly*, London, March 1885, vol. iii., p. 95.

† *Ibid.*, August 1885, vol. iii., p. 254.

‡ Patent Office Register, No. 14,050, A.D. 1884.

SOLUTION OF PUZZLES.

PUZZLE XIII. *It is required to divide* ABCD, *fig.* 8, *by straight cuts into four parts, which shall fit in* aFLK (*fig.* 9), *a parallelogram having the angle a equal to the angle* A, *and its sides* aF, aK *in a given proportion, by the first of the two methods employed for rectangles in the last number.*

In AB take E (fig. 11), so that AD : AE :: aK : aF. On AB (towards DC) describe the circular arc AFB to contain an

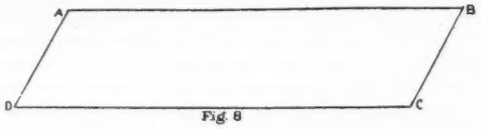


Fig. 8

angle AFB equal to the angle ADC. (Complete the circle, for future purpose, by the arc AF′B containing an angle equal to the angle DAB.) Through E draw the chord FEF′ parallel to AD; draw FB cutting DC in H; and take FL equal to HB. Complete the parallelogram AKLF. Then I leave it to the student to show by similar triangles AEF, FAB; and by the proportion DA : AE :: aK : aF (fig. 9), that AKLF is in all respects equal to aKLF. It will also be easy for him to see

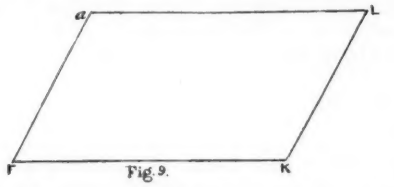


Fig. 9.

that if KM is drawn parallel to AD, the spaces numbered 1, 2, 3, 4 in ABCD are in all respects equal to the spaces similarly numbered in AKLF.

Thus ABCD is divided as required.

PUZZLE XIV.—*To do the like by the second method employed for rectangles in the last number.*

Part of the construction is shown in fig. 11, AF′ being the shorter side of the rectangle required. We complete the parallelogram AKLF as in fig. 12; take BG equal to FL, and

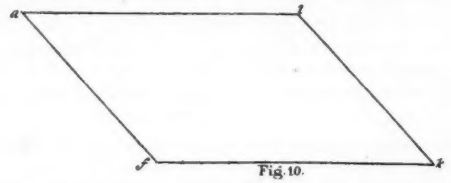


Fig. 10.

draw the parallels JG, GM, cutting off also the small triangle *ghk* equal to JFG in all respects. Then the parts of ABCD, numbered 1, 2, 3, 4, are in all respects equal to the parts similarly numbered in AKLF.

NOTE. Remarks similar to those made in regard to the division of rectangles apply also to the division of these

equi-angled parallelograms—more cuts (or fewer) may be required according to the proportions of the different rectangles. But no difficulty will be found in extending the construction to cases where one or other or both parallelograms have very unequal sides.

PUZZLE XV.—*To divide either of the rectangles* ABCD (fig. 8) *and aklf* (fig. 10) *by straight cuts into three parts, which shall fit so as just to cover the other.*

It will be obvious from a few moments' study of figs. 11 and 12 that the rectangle AKLF in either figure can be

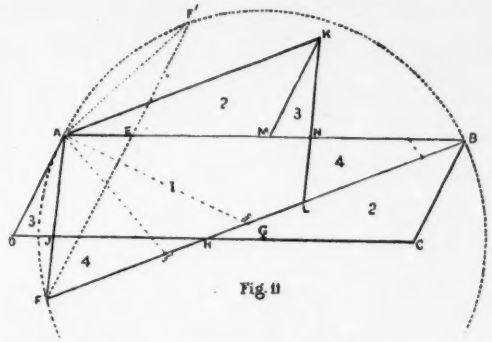


Fig. 11

divided as by lines A*f*, A*f′*, K*l*, K*l′*, in such sort that, by dividing the corresponding parts of ABCD in like manner (which is done in both figures by light broken lines), the parts of ABCD so obtained will fit on a rectangle having A*f* or A*f′*, or K*l* or K*l′* as a side, the other adjacent side being AK. For the pieces forming triangle A*ff′* may be carried to

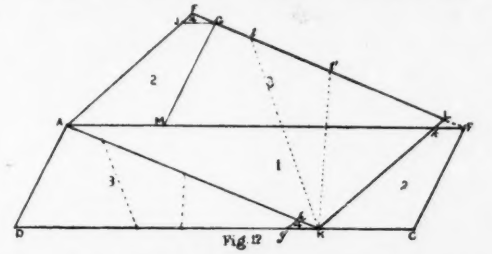


Fig. 12

fit on the side KL, or those forming A*ff′* may be so carried; or those forming K*l*L or K*l′*L carried over to fit on the side AF.

In different cases the number of cuts required will be different. But we see that for the case referred to in the puzzle, the only extra division line is A*f*, fig. 11, while the cuts corresponding to AJ, KM need not be made. We draw

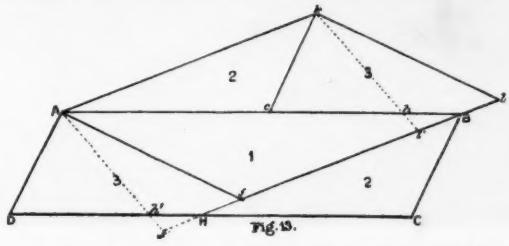


Fig. 13.

simply HB, A*f*, fig. 13, and fit the pieces numbered 1, 2, 3 in ABCD upon A*klf*, as shown.

For the case corresponding to the side A*f′*, fig. 11, for our rectangle, we get the cutting shown in fig. 13 along *khl*, *kl′*, corresponding to A*h′* and *hl′* on the parallelogram ABCD.

NOTE.—We only get a division into three parts when the extra dividing line runs as from A to a point in HL, fig. 11, or when, in the case illustrated by fig. 12, K*k*L cuts BC, and a line is drawn from A to a point in KL between K and BC. In the latter case the parallelogram formed of the pieces will have a side equal to AF, and not (as in the former case) to AK. It will be observed that by such methods any parallelogram can be divided up into parts which shall fit another parallelogram of any shape whatsoever.

PUZZLES XVI., XVII., AND XVIII.

A MAN has 687 *oranges to send off, each of which, in packing, is to be regarded as a* 2*-inch globe, and there must be no compression. He has three boxes apparently equal; but on measuring their inside capacity he finds that No.* 1 *has a base* 11 *inches square, and is* $11\frac{9}{10}$ *inches deep; No.* 2 *has a base of* 12 *inches by* $11\frac{1}{4}$ *and a depth of* $11\frac{4}{5}$ *inches; and No.* 3 *has a cubical interior* $11\frac{9}{10}$ *inches each way—length, breadth, and depth. He packed all his oranges in these three boxes. Our three puzzles for this month are:—*

PUZZLE XVI. *How did the man pack* 200 *oranges in box No.* 1*?*—11 *in.* × 11 *in.* × $11\frac{9}{10}$ *in.*

PUZZLE XVII. *How did he pack* 231 *oranges in box No.* 2*?*—$11\frac{1}{4}$ *in.* × $11\frac{1}{4}$ *in.* × $11\frac{4}{5}$ *in.*

PUZZLE XVIII. *How did he pack* 256 *oranges in box No.* 3*?*—$11\frac{9}{10}$ *in.* × $11\frac{9}{10}$ *in.* × $11\frac{9}{10}$ *in.*

In which of the three boxes was the packing closest?

SPECTRA OF A VARIABLE STAR.—At a recent meeting of the American National Academy of Sciences, Professor O. T. Sherman, of Yale, presented a catalogue of bright lines observed in the diverse changing spectra of Beta Lyræ, the well-known variable star. Sometimes all the bright lines are seen; at other times only part of them or none at all, while at times the lines are all dark. Some of the spectra indicate the existence of magnetism and other metals in the atmosphere, in a free and uncombined state. The observations indicate that a triple division exists in the atmosphere, the outer layer consisting of carbon and hydrocarbons which occasionally descend into a subjacent layer of oxygen, and undergo combustion and ultimately descend into the third layer, where the intense heat again separates the products of the combustion into their chemical elements. This theory completely explains the difficult problem of the cause of variability in the variable stars, since it is obvious that periods of extensive combustion must be attended with bright light which at other times are lacking. The observations were made by using lenses of great dispersive power and diffraction gratings.

MGR. CAPEL AND A KENTUCKY GIRL.—Mgr. Capel was the subject of a talk the other evening, the spokeswoman of the party being the daughter of our ex-minister to a foreign court and a Catholic. "I don't mean the man," she said. "He is ill-mannered. It was this way: I was talking to him and in some way referred to my youth, and said I had been raised in Kentucky. 'But, madam,' he said, with provoking irrelevancy, and in a tone of supercilious criticism, 'You should not say "raised." "Bred" is better; we say so in England.' 'Do you?' I answered with considerable warmth; 'well, I don't. In Kentucky we breed cattle and horses and mules' [and formerly niggers she might have added] 'and we raise children.' Then I turned my back on him quite as politely as he had begun the dispute and I felt better."—*Washington Post.*

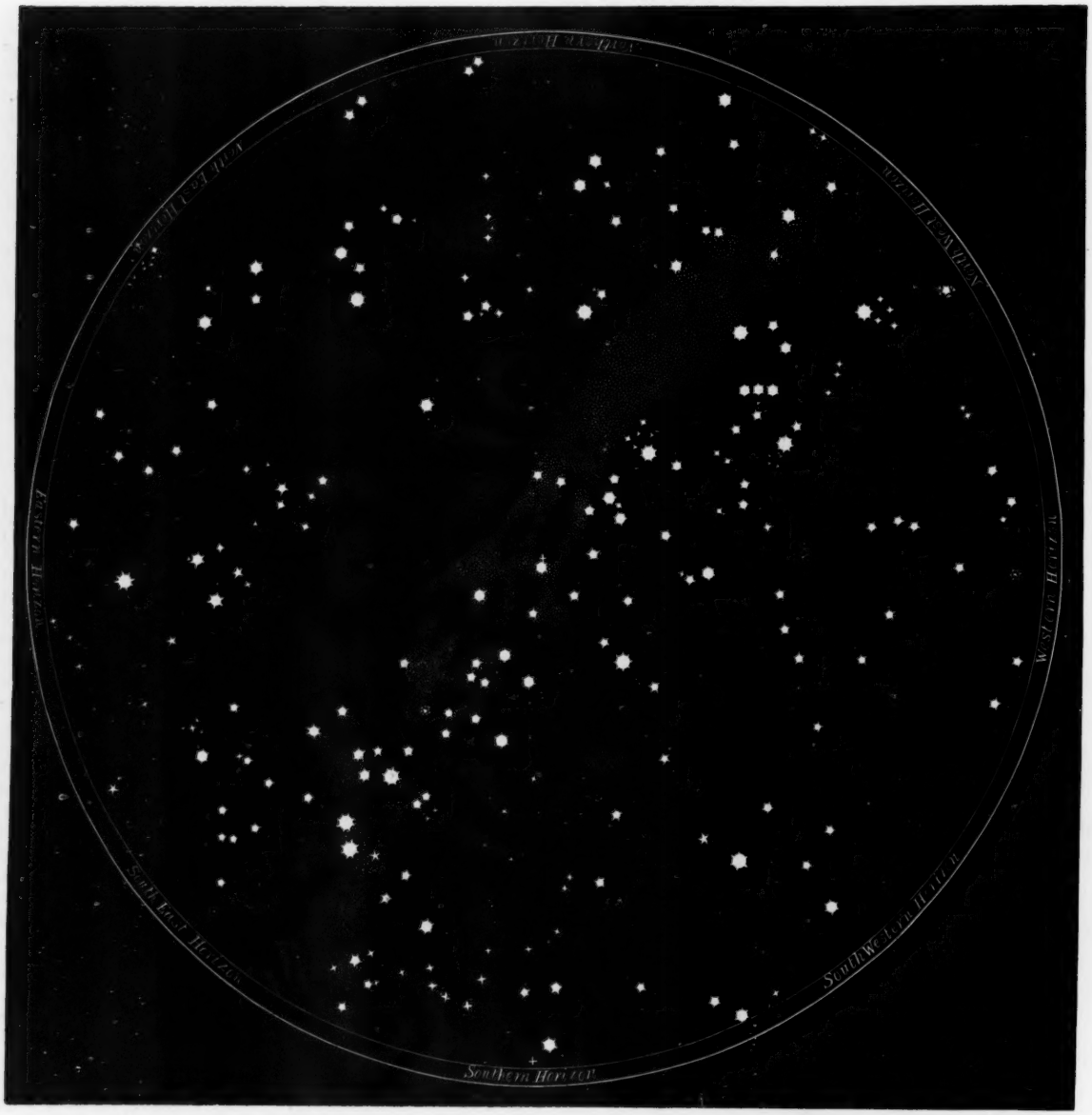
THE SOUTHERN SKIES FOR MARCH.

THE SKIES OF SOUTHERN LATITUDES AND THE SOUTH HALF OF OUR SKIES AT HOME.

TOWARDS the south in England we see, at the hours named under the map, the skies shown in the map's upper half. Along the horizon, due east, the Virgin is rising; in the south-east a few stars of *Corvus* the Crow, and the whole constellation *Crater* the Cup, are seen. Due south is a part of Argo, merely the poop showing above our horizon; on its right the Dog *Canis*; Orion in the south-west; and beyond, towards the west, a part of the River, *Eridanus*; and the head of the Sea Monster, *Cetus*, almost due west.

Travelling southwards, the voyager at the same seasons and hours sees more and more of Argo towards the south. In the manner described last month, the Centaur, the Cross, and the Magellanic Clouds rise above the southern horizon, precisely at the rate corresponding to the traveller's journey southwards over a spherical surface. A study of the map combined with the explanation given last month, will suffice to show precisely how the southern skyscape varies at this season, with the progress of the traveller towards the latitudes for which the map has been constructed. When those latitudes have been reached, the stellar heavens are presented as shown in the map, the centre marking the point overhead, and the circumference the horizon.

Due south, below the pole, the Peacock, *Pavo*, pleasantly imagined by Lacaille as a suitable companion for the Indian,



NIGHT SKIES OF THE SOUTHERN HEMISPHERE FOR MARCH.—For Index Map see opposite page.

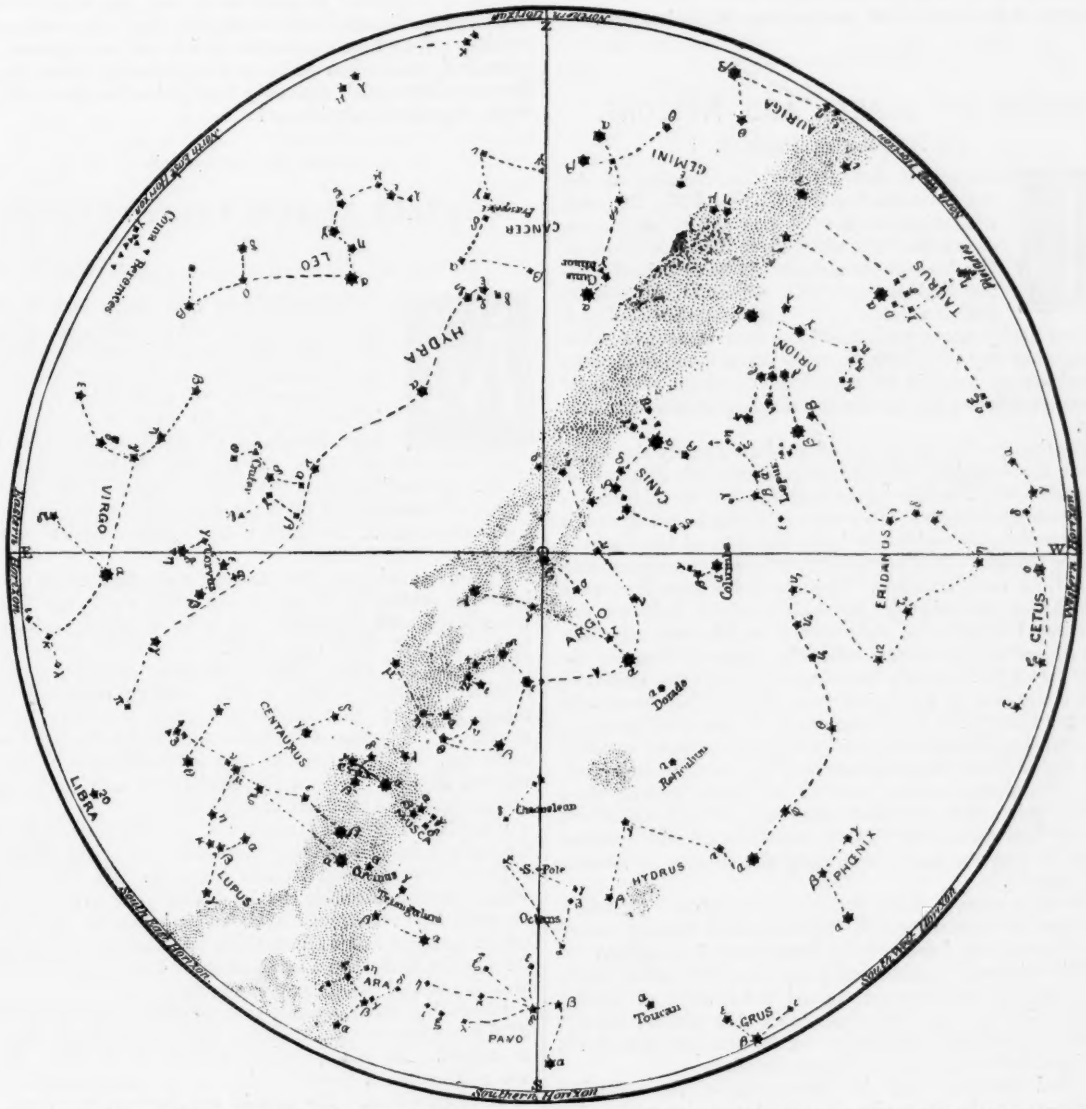
an Octant, an Altar, and a Triangle, stands naturally on its head. In the south-east we see the Centaur, offering the Wolf, *Lupus*, on the Altar, *Ara*, all being in extraordinary positions, for *Centaurus* is prone on his human face and his equine chest and forelegs, while the Altar is inverted. The Cross, *Crux*, lies on its side, half-way between the horizon and the point overhead.

On the western side of the south we see the Magellanic Clouds, high up; the Phœnix low down in the south-west, and the River *Eridanus* straggling along towards the west and beyond; besides several small constellations and parts of constellations not very noteworthy.

Overhead is the Ship *Argo*, and the very interesting region of the Milky Way, in the midst of the Ship, where the great galactic stream is interrupted, and two fan-shaped expansions stretch out towards the dark gap.

Turning to the east, we see the Virgin, *Virgo*, low down; above her, *Corvus*, the Crow, and above that, slightly to the left, the Cup, *Crater*. *Hydra*, the Sea Serpent, of which these two small constellations were once part, extends athwart the mid-east towards the mid-north, near which we see the Sea Serpent's head. In the north-east is the Lion, *Leo*; next him, nearly due north, is the Crab, *Cancer*; then, west of north, we see *Gemini*, extended horizontally; and, passing along the zodiac, we come to *Taurus*, extending low and long, above the north-west horizon.

Nearly overhead, in the north-west, is *Canis*, the Dog, with the splendid Sirius, shining more brightly, though less



NIGHT SKIES OF THE SOUTHERN HEMISPHERE FOR MARCH, SHOWING THE SOUTHERN HALF OF OUR NORTHERN SKIES (UPPER HALF OF THE MAP) AND THE WHOLE OF THE SKIES IN SOUTHERN LATITUDES, AT THE FOLLOWING TIMES:—

At 10 o'clock, March 8.	At 9¼ o'clock, March 20.	At 8½ o'clock, March 30.
„ 9¾ „ March 12.	„ 9 „ March 23.	„ 8¼ „ April 3.
„ 9½ „ March 16.	„ 8¾ „ March 26.	„ 8 „ April 7.

beautifully than in our northern skies, where his light is always affected with the colouring due to atmospheric undulations. Next, high in the west, is the small Hare, *Lepus*; and in the very middle of the north-west quadrant of the heavens we see Orion, which alone of all these familiar constellations is easily recognised, seeing that, whereas the Lion, Twins, and Bull, the Dog, the Hare, and the Sea Monster (low down in the west) present forms quite unlike those we know, Orion with his gleaming belt stars and the bright Betelgeux, Rigel, and Bellatrix at once shows himself for what he is—the noblest constellation in the heavens.

ORIGIN OF COMETS AND METEORS.

BY RICHARD A. PROCTOR.

I OBSERVE that at the last meeting of the Astronomical Society, my friend Mr. Ranyard, remarking on the ejection theory of comets, shows that the wideness of the radiant area of the Andromede meteors can be explained without that theory—with which (I had pointed out) it accords well. I should not wonder if the peculiarity can be explained in another way, or in half a dozen other ways. I have, however, never found in my own experience, or noted in the experience of others, that a new general truth can be reached by nibbling at details in that way.

The theory of ejection was adopted as the only theory by which the chemical, physical, and microscopic structure of meteorites of all orders—from holosiderites to asiderites—can be accounted for. They were certainly once exposed to such conditions as exist only in the interiors of large orbs—suns or planets. And as certainly they have somehow come forth from such interiors. The expulsive force shown by observation to reside in the only sun-like body we can examine, indicates the only way in which such expulsion can conceivably have been effected. Hence I infer (for my own part I feel assured, knowing the weight of evidence) that all orders of meteorites were expelled from some orbs at some time when such orbs were in the sunlike stage. Generalising, I include in this theory all orders of meteors, and find all their most characteristic peculiarities explained, and all orders of meteor systems or comets, finding their several orders thus and thus alone explicable (if we include all suns now and in the past, all planets in all solar systems, in their past sunlike state, among the sources of meteors and comets).

No other general theory seems to me possible. Certainly no other has been advanced. (Schiaparelli's capture theory explains nothing, besides being dynamically impossible.)

This being so, to prove that some tiny little detail might be reconciled with some imagined prior state of things, which might or might not agree with this general theory, seems to me a waste of time, so far as the question of the origin of comets and meteors is concerned.

I find the same fault in nine-tenths of the reasoning employed in the discussion of general theories. The idea seems to prevail that a theory may be established or overthrown by proving some bare possibility about some exceedingly small detail. It is as though one were to show that the movement of a particular piece of iron towards the earth might have been caused by a magnet placed in such and such a position, and thereupon were to say, "Where is your theory of terrestrial gravity *now*?"

Another way, as the cookbooks have it—a method peculiarly affected by some American astronomers I wot of—is to show that one particular part of a theory will not explain a group of facts which belongs to another part of the theory—as, for instance, that the expulsion of matter from the sun cannot explain the closed orbits of the Leonids or the paths of comets nowhere approaching within many millions of miles of the sun.

What has really to be considered in such a case is the bearing of a general theory on the facts, many in number and diverse in aspect, which suggested it, and which it is intended to explain; not whether this or that fact can be separately explained in some other way, or whether one branch of the theory is able to explain the facts relating to another. Why take up matters which can be explained in a hundred ways, when we know that the really determinant facts are those which can only be explained in two or three ways, or perhaps only in one?

A YANKEE AT KING ARTHUR'S COURT.

REPORT OF A DISCOURSE BY MARK TWAIN.*

MR. CLEMENS said that that which he was about to read was part of a still uncompleted book, of which he would give the first chapter by way of explanation, and follow it with selected fragments, "or outline the rest of it in bulk, so to speak; do as the dying cowboy admonished his spiritual adviser to do, 'just leave out the details, and heave in the bottom facts.'"

Mr. Clemens' story is the autobiography of Sir Robert Smith, of Camelot, one of King Arthur's knights, formerly a manufacturer of Hartford, Conn. Robert Smith says of himself:

"I am a Yankee of the Yankees, a practical man, nearly barren of sentiment or poetry—in other words, my father was a blacksmith, my uncle was a horse doctor, and I was both. Then I went over to the great arms factory and learned my real trade—learned to make everything, guns, revolvers, cannon, boilers, engines, electric machines, anything, in short, that anybody wanted anywhere in the world. . . . I became a head boss and had a thousand men under me. Well, a man like that is full of fight—that goes without saying. With a thousand rough men under one, one has plenty of that sort of amusement.

"At last I met my match; I got my dose. It was during a misunderstanding conducted with iron crowbars with a fellow we used to call Hercules. He laid me out with a crusher alongside the head that made every joint of my skull lap over on its neighbour, and then the world went out in darkness and I felt nothing more, knew nothing more for a while, and when I came to again I was standing under an oak tree and the factory was gone.

"Standing under an oak tree on the grass with a beautiful broad country, a landscape spread out before me—all to myself. No, not quite, not entirely to myself. There was a fellow on a horse looking at me—a fellow fresh out of a picture-book. He was in old-time armour from his head to his heel. He had a helmet on like a cheese-box with slits in it, and he carried a shield and sword and a prodigious spear. And his horse had armour on, too, and gorgeous silken trappings, red and green, that hung around him like a bedgown to the ground. And this apparition said to me:

"'Fair sir! Will you joust?'

* Delivered at the last meeting of the Military Service Institution, Governor's Island, General J. B. Fry in the chair; Generals W. T. Sherman and Schofield on the platform.

"Said I, 'Will I which?'

"'Will you joust? Will you break a lance for land or lady?'

"Said I, 'What are you giving me? You go along back to your circus, or I'll report you.'

"Now what does this fellow do but fall back a couple of hundred yards, and then come tilting at me as hard as he could drive, his cheese-box down close and his long spear pointed straight at me. I saw he meant business, so I was up the tree when he arrived. Well, he allowed I was his property; the captive of his spear. There was argument on his side and the bulk of the advantage, so I judged it best to humour him, and we fixed up an agreement. I was to go along with him, and he wasn't to hurt me. So I came down, and we started away, I walking by the side of his horse; and we marched comfortably along through the glades and over brooks that I could not remember to have seen before. It puzzled me ever so much, and yet we didn't come to any circus, or any sign of a circus, so I gave up the idea of a circus, and concluded he was from an asylum. But we never came to any asylum, so I was up a stump, as you may say."

And so the two wander on together, and amid scenes of human life that afford the author many opportunities for quaint philosophic contrasts and dry humour, until they came to Camelot, to the Court of King Arthur. Fanciful and curious are the reflections of the transposed Yankee about that place—which he at first thinks must be the asylum—in its country of soft, reposeful summer landscape, as lovely as a dream and lonesome as Sunday, where the air was full of the smell of flowers and the buzzing of insects and the twittering of birds, and there were no people, or waggons, or life, or anything going on.

Very vividly he portrays the scene at Camelot, where King Arthur, with his knights, sits at a round table as big as a circus ring, and three hundred dogs fight for bones around them; while the musicians are in one gallery high aloft, and the ladies in another. But before he gets in there he seeks information from a plain-looking man in the outer court, saying to him: "'Now, my friend, do me a kindness. Tell me, do you belong to the asylum, or are you just here on a visit, or something like that?' And he looked me over stupidly, and said: 'Marry! Fair sir——' 'Oh!' I said, 'that will do. I guess you are a patient.' To another he said: 'Now, my friend, if I could see the head-keeper just a minute—only just a minute.' He said: 'Prithee do not let me.' 'Let you what?' 'Do not hinder me, if the word please thee better.' And he was an under-cook, and had no time to talk, though he would like to another time, for it would just comfort his very liver to know where I got my clothes."

Then another—a lad—came to him, saying that he was a page. "'Oh! go along,' I said; 'you ain't more than a paragraph.'" The page happened to mention that he was born in the beginning of the year 513.

"It made the cold chills creep over me. I stopped and said, a little faintly, 'Now, maybe I didn't hear you just right. Would you say that again, and say it slow? What year did you say it was?'—'The year 513.'

"'And, according to your notions—according to your lights and superstitions—what year is it now?'—'Why,' he said, 'the year 528, the 19th of June.' Well, I felt a mournful sinking of the heart, and muttered, 'I shall never see my friends again—never see my friends any more; they won't be born for as much as a thousand years.'"

The speaker had often been interrupted by laughter, but at the originality and fun of that conceit his auditors laughed until they cried, and kept on laughing with renewed outbursts over and over again. How the 'cute Yankee determined to get at the bottom facts about the year by watching for a total eclipse of the sun, that he remembered the almanack of 1884 had spoken of as having occurred in 528, will have to be learned from the book when it appears.

"I made up my mind to two things. If it was still the nineteenth century, and I was amongst lunatics and couldn't get away, I would boss that asylum or know the reason why, and if, on the other hand, it was really the sixth century, all right. I didn't want any better thing; I'd boss the whole country inside of three months, for I judged I'd have the start on the best educated man in the kingdom by 1,300 years. . . . . But I'm not a man to waste time, so I said to the boy: 'Clarence, if your name should happen to be Clarence, what's the name of that duck, that galoot, who brought me here?'"

The galoot turned out to be Sir Kay, the seneschal. In the natural course of the story came the charming description of the interior of King Arthur's castle, leading up to a royally funny account of the competitive lying of the gallant knights about their feats at arms. The transposed Smith looked upon the knights as a sort of "white Indians," admired their bigness and their simplicity, and eventually concluded:

"There didn't seem to be brains enough in the entire nursery to bait a fishhook, but you didn't mind that after a little while, for you saw that brains were not needed in a society like that, and would have marred its symmetry and spoiled it."

Everybody goes to sleep when Merlin reels off that same old story about Excalibur. Guinevere makes eyes at Launcelot in a way that would have got him shot in Arkansas. King Arthur orders the Yankee to go to some unknown place not down in any map, capture a castle, kill the colossal, saucer-eyed ogre who owned it, and release sixty royal princesses. Of course he went, but he reflected.

"Well, of all the d——d contracts, this is boss! I offered to sublet it to Sir Launcelot, to let him have it ninety days, with no margin; but 'No,' he had got a better thing. He was going for a menagerie of one-eyed giants and a college of princesses."

It occurs to him finally, after wondering if a compromise with the ogre wouldn't work, simply to go back and tell the king with artistic circumstantiality of detail, that he was killed by the ogre. He does so, and, of course, the king and his knights, who are used to swallowing each other's huge lies, readily take in his, and a brilliant career opens before him as the boss liar of the court.

He took a contract from King Arthur to kill off at one of the great tournaments fifteen kings and many acres of hostile armoured knights. When, lance in rest, they charged by squadrons upon him, he, behind the protection of a barbed wire fence charged with electricity, mowed them down with Gatling guns that he had made for the occasion. He found that the "education of the nineteenth century is plenty good enough capital to go into business in the sixth century with," and the next year he was running the kingdom all by himself on a moderate royalty of 40 per cent.

He spoiled the ogre business; cleared out the fuss and flummery of romance, and put King Arthur's kingdom on a strictly business basis. Inside of three and a half years the improvement was complete. Cast-iron clothes had gone out of fashion. Sir Launcelot was running a kind of Louisiana lottery. The search for the holy grail had been given up in favour of a hunt for the north-west passage. King Arthur's 140 illustrious knights had turned themselves into a stock-board, and a seat at the round table was worth 30,000 dols.

XUM

Gossip.

By RICHARD A. PROCTOR.

I SHALL have remarks to make later about a sundial for mean time and a tellurium described and pictured for me by two correspondents, and about a question relating to Euclid, Book I., 32, and Axiom 12, by another.

* * *

I GIVE this month, as illustrating Americanisms not only of words but of manner, an account of a humorous lecture delivered by Mark Twain a few weeks ago in New York. The "Notes" will be continued next month. There is in any case no occasion to hurry with the alphabetical treatment of Americanisms, seeing that modes of expression supply quite as good illustrations of the way in which our cousins across the Atlantic speak English as mere words. The reader of Mr. Clemens's amusing address will find several illustrations of American peculiarities, and of modes of speaking which, if not absolutely peculiar to America, are more commonly to be noticed in the States than in the old country.

* * *

I AM reminded for a moment of the peevishly ignorant criticism in the *Saturday Review* some time back. A new weekly, speaking of my remarks thereanent, says that I interrupted my notes to "go for" that critic—as Americans say. I would invite attention to the fact that most of what I said related directly to Americanisms. My critic's ignorance of the subject gave me occasion to explain correctly a number of words which he had blundered over. Except in not being alphabetically arranged, the words "Gum," "Use," "Peart," "Horse Fiddle," and a number of others, belonged as truly to my "Notes on Americanisms" as any in former articles. I was interested myself to notice how much more occasion there was for explanation of Americanisms than I had supposed; since here was one who at least pretended to know something of the subject falling into mistake after mistake about the simplest, and, I had supposed, the best known, American usages.

* * *

FOR the rest, the *Saturday Review* critique illustrated well what I formerly said in these pages in comparing anonymous detraction to dynamite. For though the weakness of the style, and the ignorance in regard to details, sufficed to assure me the article was not written by anyone worth considering, certain coincidences led me to the mistaken idea that points had been suggested by one of very different quality. I suffer the annoyance of having made this mistake, and of having so caused annoyance to others whom I greatly esteem. All which would have been prevented if the *Saturday Review* criticisms were signed, or if at least the columns of that paper were open to an occasional line of remonstrance or explanation.

* * *

I LEARN, however, with satisfaction and some amusement, that the proprietors of the paper have recently had a lesson in this respect.

* * *

WHAT a strange system it is, anyway, by which, in the case of all works really the product of long and careful labour, criticism is often entrusted to writers who have given scarcely any time and attention to the subject. A man shall give twenty years to some special study, and present the result of his work in book form: then does John Noakes or Thomas Styles, sitting down quickly, proclaim that——"While 'we' find a good deal that is interesting in this work, we must point out that the conclusions of the author are not such as will commend themselves to men of science," neither John Noakes nor Thomas Styles knowing more about the opinions of men of science than they do about the subject of the treatise whose leaves they have perhaps just cut, but quite possibly not.

* * *

THERE is a mistake in my article on earthquakes (KNOWLEDGE for November, p. 2) by which my argument about the pressure of the atmosphere is badly weakened. I had calculated the difference of pressure for two inches change in the mercurial barometer. But while the article was waiting to be sent off to England, I received a telegram from the editor of the *North American Review* asking me to send him an article on the earthquake, and in that article I dealt with a difference of only one inch in the barometer. (The article appeared in the October number of that magazine.) It occurred to me then that it would be far better to adopt the same difference in the article I had written for KNOWLEDGE. I supposed I had made the necessary corrections; but I remember a visitor called while I was making up matter for KNOWLEDGE, and I can only suppose that I was interrupted after I had halved the pressures, and before I had halved the differences in the barometer. If the reader will complete the alterations at p. 2 by writing one inch for two inches throughout, the statements will be made correct. The strength of the argument will be doubled—not that I think this greatly matters, as 100 millions of tons are as far beyond our power of conception as 200 millions. Still, it is well to be accurate in such statements. My wish to be moderate led to the mistake.

* * *

A CORRESPONDENT referring to KNOWLEDGE (p. 16), Nov. 1, 1886, says:—

> It was not Augustine but Tertullian who said "credo quia impossibile est." The expression occurs somewhere in his treatise "De Carne." I have not the exact reference at hand, but the passage is well known.

* * *

THE correction is just. I was for the moment thinking of Augustine in another connection. His special weakness before, as he puts it, "an incredible conflagration was enkindled within him" by the treatises of divers Platonists, was to require demonstration of things spiritual, not merely to be shown they were possible, far less to know they were impossible, before he accepted them with fulness of faith. In his tract "De utilitate credendi" Augustine came near Tertullian's paradox in the "De Carne Christi." Augustine is, of course, the greater of the two, though he might have written even such a saying as Tertullian's, seeing that, as was well said of him, he sports with Punic arguments, fearing to sicken the reader with tedium of his verbosity (*lectorem ne multiloquii tædio fastidiat, Punicis quibusdam argutiis recreare solet*).

* * *

ANOTHER correspondent writes as follows:—

> You say in KNOWLEDGE, July 1 (in article on Americanisms) that "*Dumpy*, for sad, is about as old English as can well be," which may be true enough, although I am not aware of its occurrence in any writer earlier than about 1530–40; but you are unquestionably in error in quoting the ballad of "Chevy Chase" as evidence of its antiquity, for the old *original* ballad (written probably not long after the battle, which was fought in 1388) has nothing whatever about "dumps" and Witherington fighting "on his stumps." The lines you mention are only to be found in the modernised version, which was certainly not made till some time after 1600, and [is] therefore no authority on "old English."

I AM obliged for the note; but it involves no correction. The beginning of the seventeenth century would be quite old enough to show that "in the dumps" and "dumpy" are not Americanisms but old English. In reality the usage must be much older. I suppose the passage referred to as belonging to about 1530–1540, is Surrey's

My sinews dull in dumps I stand.

(Surrey died in 1547.) Of course this use of the word by Surrey shows that it was a familiar word in his day, and it may fairly be regarded as already an old word then. But as a matter of fact, its derivation from the Norse *domp* or *dump* would suffice to prove that it is Old English as well as old English, which last was all I said of it. "The dumps" would be equivalent to "the vapours." Chaucer in the "Nonnes Preestes Tale" speaks of one who needs purging "of melancholie," as "replete of humours hote." Dumps, i.e. damps, humours, vapours, all equally imply gloom.

* * *

THE verse about Witherington in the ancient version of "Chevy Chase" (which I have long known by heart), runs thus:—

For Witherington my heart was wae,
That ever he slaine should be;
For when both his legs were hewn in two,
Yet he kneel'd and fought on his knee.

(The poet seems to have striven to make Witherington some amends by throwing in an extra foot in each of the last two lines.) In the comparatively modern version, quoted by Addison in apparent ignorance of any older one, we find Witherington's sad lot dealt with less poetically:—

For Witherington needs must I wail,
As one in doleful dumps;
For when his legs were smitten off,
He fought upon his stumps.

* * *

WE shall do such of our readers as may not have seen the December number of the *Fortnightly Review* a service by calling their serious attention to Professor Huxley's article on "Science and Morals" in that journal. It is a reply to a charge by Mr. Lilly that the Professor, together with Mr. Herbert Spencer and the late Professor Clifford, agree in setting aside as unverifiable everything which the senses cannot verify, or which lies beyond the bounds of physical science, or which cannot be analysed in the laboratory. If Mr. Lilly has read with due care and comprehension Professor Huxley's essays on "Descartes" and "Berkeley," on "Sensation and the Sensiferous Organs," and notably the celebrated essay on the "Physical Basis of Life," it is difficult to acquit him of wilful misrepresentation of their writer's consistent attitude towards what is commonly understood by materialism. Professor Huxley has, however, an easy victory, and we are inclined to thank Mr. Lilley for having educed a manifesto as to the non-atheistic and non-spiritualistic character of science, truly so-called, the permanent value of which cannot be overrated. The paper is worth reading for its crispness, clearness, and dignity of style alone, and as to the matter, let it be read and re-read until it is thoroughly assimilated.

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Reviews.

The Methods of Glass-Blowing. By W. A. SHENSTONE. (London: Rivingtons. 1886.)—With the exception of the directions given in a treatise which appeared many years ago, and then only existed in the form of two or three unbound sheets, nothing worthy of the name of instructions in glass-blowing have appeared since those given by Faraday in his "Chemical Manipulation," first published in 1827. Mr. Shenstone then has supplied a very real want in the little book before us, and has earned the gratitude of all students of chemistry and physics by his simple and well-illustrated description of the methods adopted in the construction of all such glass apparatus as is ordinarily in use in the laboratory. He begins by describing the few and simple tools and materials requisite; explains the difference between lead glass and soda glass; and then initiates the beginner in the simple operations of cutting, bending, widening, and piercing tubes, and teaches him how to blow bulbs and grind stoppers. In a subsequent chapter the knowledge thus acquired is directed to the production of complicated pieces of apparatus, and the work concludes with an account of the way in which glass vessels and tubes are graduated and calibrated. An appendix gives full-sized sectional diagrams of the various glass tubes purchasable, with their trade numeral designations appended. We have two trivial faults to find with this capital little book. The first is, that its author's description of the blow-pipe and its adjuncts applies solely to that form in which gas is used, and is, therefore, of use only to those resident in towns. The second complaint we have to make is that every measure in the book is given in millimètres, centimètres, and the like, the honest English inch being as absolutely ignored as the Chinese chid. When the metric system is made compulsory in this country, it will be quite time enough to make this cheap display of learning.

Circular Work in Carpentry and Joinery. By GEORGE COLLINGS. Weale's Series. (London: Crosby Lockwood & Co. 1886.)—Mr. Collings has made a real contribution to technical education in the work before us; and the joiner who will thoroughly master its contents will possess an amount of knowledge but too rare among his *confrères*, and hence be in a position to demand the highest remuneration that his trade affords. Both the theory and practice of curved work in timber are explained intelligently and intelligibly by our author, who, beginning with the most simple examples of single curvature (such, for instance, as segment-headed window frames and the like), leads his pupil through others of gradually increasing complexity to such master-pieces of carpentry as domes, and ogee and apsidal roofs. Mr. Collings's mathematical illustrations of the principles underlying the construction of the various pieces of work he describes are in no case beyond the apprehension of any moderately well-educated artificer; and, in short, both theoretically and practically, his book leaves nothing to be desired. But we do wish that he would not write minutes and seconds of arc for feet and inches.

How to develop General Vocal Power. By J. P. SANDLANDS, M.A. (London: Sampson Low, Marston, Searle, & Rivington. 1886.)—While primarily, apparently, addressed to stammerers, for whose cure the major part of the exercises it contains are intended, Mr. Sandlands' volume may also be recommended to all who wish to read distinctly and impressively. His vocal gymnastics seem to be well adapted at once to remove vocal impediments in those suffering from defective articulation, and to improve declamatory power in those not so afflicted. It may be profitably studied by both the stammerer and the would-be orator.

XUM

Through Dark to Light. By A. EUBULE-EVANS. (London: Wyman & Sons. 1886.)—In a series of detached poems, the author of "Through Dark to Light" gives a picture of the passage of the Soul from Pessimism through suspended judgment to Optimism. His imagery in places is fine, and his versification very superior indeed to the mass of rhyme which flows so copiously from the press nowadays. Whether, though, his logic is equal to his poetry, the reader must judge for himself.

Heroes of Science. Physicists. By WM. GARNETT, M.A., D.C.L. (London: Society for Promoting Christian Knowledge.)—The "Heroes" whose biographies are given in Dr. Garnett's most readable and pleasant volume are Robert Boyle, Benjamin Franklin, Henry Cavendish, Count Rumford, Thomas Young, Michael Faraday, and James Clerk Maxwell—men sufficiently removed from each other in time, social position, and surroundings to render them typical. One excellent feature in the work before us is that its author contrives to interweave an account of the discoveries of the men whose lives he is writing with merely biographical detail proper, thus rendering his essays at once valuable and interesting. It is sad to think that the results of Cavendish's marvellously exact experiments in determining quantitatively the effects of electricity remained buried in manuscript for nearly ninety years, and that Faraday, in total ignorance of their existence, went over a great deal of the ground previously traversed by his predecessor—only, of course, to rediscover what had been established in the last century. Surely this affords a pregnant illustration of the evil attendant on the suppression or long postponement of the appearance of scientific memoirs. It was our intention to have quoted certain passages from more than one of the chapters in Dr. Garnett's book, but we will not forestall the pleasure of the reader (whom we heartily recommend to obtain it) by doing so. Anyone seeking for an appropriate Christmas present for an intelligent youth could hardly do better than purchase this new volume of the "Heroes of Science" straightway.

Electricity in the Service of Man. From the German of Dr. A. R. VON URBANITZKY. Edited by R. WORMELL, D Sc., M.A. With an Introduction by JOHN PERRY, M.E., F.R.S. (London: Cassell & Co. 1886.)—In the excellent and very interesting introduction prefixed to the work whose title heads this notice, Professor Perry invites attention to the noteworthy fact that, prior to about the year 1870, there were really no text-books on the *science* of electricity. Works in vogue prior to that date contained, it is true, recapitulations of Franklin's speculations on the nature of electricity, descriptions of electrical machines and voltaic batteries, and of the pretty and brilliant experiments which might be performed by their aid, &c.; though, as he proceeds to say, such volumes were usually only redeemed from worthlessness by some account being given of Faraday's experiments; concerning which readers found that the main outcome of Faraday's work was the Ruhmkorff induction coil, whose important function was to illuminate Geissler's tubes for children's parties. How Dr. Everett, Sir William Thomson, Fleeming Jenkin, and Clerk Maxwell showed in what manner measurement and calculation could be applied to the elucidation of electrical phenomena, and how thenceforth invention and discovery proceeded *pari passu* with increased theoretical knowledge, is forcibly pointed out. Mr. Perry then goes on to elucidate the fundamental idea of "potential," and, by reasoning analogically from the behaviour of flowing water, to show the difference between electricity and electrical energy; concluding with a table of the various electrical magnitudes. This model preliminary discourse forms, however, a mere short preface to Dr. von Urbanitzky's practically exhaustive treatise, which forms a true monument of German skill, patience and thoroughness, occupying, as it does, 845 pretty closely printed pages, and containing no less than 836 well-executed wood engravings. Of these pages, 224 are devoted to the history and principles of electricity and magnetism, and the student, being supposed to have mastered them, is then introduced to the technology of electricity, to which the remainder of the work is devoted. Here will be found the most minute description of the various apparatus employed in rendering electricity subservient to economical purposes; and the general reader may familiarise himself with the construction and use of the different forms of dynamo-machine, with those of the electric telegraph, telephone, microphone, and phonograph, with every variety of electric lighting, with the apparatus employed in electro-metallurgy, with the utilisation of electricity as a motor, and, in short, with those numerous practical applications of electricity to the wants of our daily life which are becoming so rapidly more and more important and frequent. This is a book without which no physical library can be held to be complete, containing as it does between its two covers the sum and substance of numerous volumes. To the student it may be commended as an admirably full and clear introduction to the science and art of electricity; while to the advanced electrician it will be found of almost equal value as a book of reference. It is furnished with that desideratum a capital index.

Handbook of Acoustics. By T. F. HARRIS, B.Sc., F.C.S. (London: J. Curwen & Sons.)—Mr. Harris has produced a very thorough little book, and within the compass of 247 pages contrived to impart, in simple and perspicuous language, a large amount of information on the subject of acoustics generally. Although primarily addressed apparently to those studying the theory of music, a large part of the volume must possess equal interest for the student of general physics. Our author intimates in his preface that a mastery of the contents of his work will enable a candidate to work papers in certain examinations. We think (seeing what the word "examination" ordinarily connotes) that he does himself a certain amount of injustice in this. His "Handbook of Acoustics" is much too good to be used as a mere cram-book.

Cassell's Public School French Reader. By GUILLAUME S. CONRAD. (London, Paris, New York, and Melbourne: Cassell & Co.)—This graduated series of exercises for reading exhibits certain alterations and modifications, typographical and otherwise, which we cannot but regard as improvements on previous works of a similar character. Certainly they ought to enable the beginner to read French better and more intelligently than he is now taught to do.

Watch and Clockmakers' Handbook. By F. J. BRITTEN. Sixth edition. (London: W. Kent & Co. New York: E. & F. N. Spon.)—Very little more than two years have elapsed since we spoke in words of commendation of the first edition of Mr. Britten's excellent handbook (KNOWLEDGE, vol. v., p. 230), and already the sixth edition is on our table. Nor, considering the care with which its large amount of heterogeneous contents is brought up to date, is this to be wondered at, and we trust that even the twentieth edition may yet reach us for notice.

Illustrated Lectures on Ambulance Work. By R. LAWTON ROBERTS, M.D. Second edition. (London: H. K. Lewis. 1886.)—Here is the second edition of another book, admirable in a very different way to that just noticed; the first edition of which we have also previously reviewed (KNOWLEDGE, vol. viii., p. 53). We can only here reiterate the praise which we bestowed on Dr. Roberts's work when it first appeared, and add that in its latest issue it has been partly remodelled, and that a good deal of fresh matter,

together with six new illustrations, have been added. This little volume addresses everybody who is ever likely to suffer from an accident or to be present when one happens; and its careful study may save many a precious life.

BOOKS FOR BOYS.

Charlie Lucken at School and College. By Rev. H. C. ADAMS. (Hodder & Stoughton.)—The incidents of this story of school life are laid in the early part of the present century, the ugly social troubles of which are vividly portrayed. Apart from these, there is abundant excitement in the narrative to ensure it a welcome among books for Christmas holiday reading, while the name of the author is guarantee for the absence of mawkishness and the presence of wholesome tone.

A Flood that led on to Fortune. By OLD BOOMERANG. (Hodder & Stoughton.)—This is a stirring story of the battle of man against nature in the great rainfall of 1861 by a writer who has long held the field as a graphic narrator of life among the Australian squatters. Both works are well illustrated and attractively bound. The same commendation as to their get-up applies to the books of the season issued by Messrs. Blackie & Son, who are in their accustomed front place with a batch of capital stories. Among these we may give prominent welcome to Mr. Henty's *With Wolfe in Canada*, which, with one Jim Walshman, smuggler, sailor, and soldier, as the hero, tells the story of our victorious struggle—charged with momentous issues—against the French for supremacy in the New World. *Reefer and Rifleman*, by J. Percy Groves, is a tale of the two services in the early years of this century, with plenty of adventure in humorous setting. *Tales of Captivity and Exile* is concerned with the more sombre but interesting record, from antiquity to modern times, of the imprisonment or exile of men, good and bad alike, who had the courage of their convictions, and suffered accordingly. The same publishers have issued handsome reprints of Mr. George Macdonald's *At the Back of the North Wind* and *Ranald Bannerman's Boyhood*, while for the children who have found delight in these standard favourites a feast of good things is provided in Miss Alice Corkran's *Down the Snow Stairs*. These lead to Dreamland, where—as in the Persian Avesta, the soul of the good man is confronted by a fair maiden, who reveals herself as his good thoughts and deeds in life; or, as in the fabled hell, the vices of men pursue them like Nemesis—Kitty, the heroine, meets troops of children to whom is meted that which they measured out to dumb and weaker things, till Love sets them free. But the moral is never obtruded to the obscuring of the story, the charm of which is increased by Mr. Gordon Browne's fantastic illustrations.

Turning from fiction to sober history, we may commend *True Stories from English History* (Griffith & Farran), selected from writers of all schools—the Venerable Bede, Froissart, Macaulay, and Thackeray—by Mr. Oscar Browning, himself an historical student of no mean repute. In *Outlines of Jewish History* (Longmans) Lady Magnus tells the history of her people from Bible times to the present day, and we are glad to have the momentous events stretching from the period of the Exile to the period of modern toleration grouped in convenient compass and presented in agreeable style. Such compression of vast material is more laborious than its expansion, and Lady Magnus has done her task extremely well. The outline sketch of Spinoza is admirable, and the significance of his philosophy on all subsequent thought pointed out.

The Story of the Nations.—Carthage. By Professor A. J. CHURCH. (Fisher Unwin.)—The learned author, whose familiar renderings of Homer and other ancients place the non-classical reader under no slight obligation to him, remarks that "the story of Carthage is mainly a story of war," and consequently the narrative of her offensive and defensive battles by sea and land, till her final conquest and demolition by Rome, fill nine-tenths of this book. The remaining tenth tells us what little can be known about the internal history of the city, her institutions, her commerce, and her art, borrowed, as this was, like that of Phœnicia, from Greece. The work could not have been entrusted to more competent hands, and will take equal rank with its predecessors in this useful series.

Legends and Popular Tales of the Basque People. By MARIANA MONTEIRO. (Fisher Unwin.)—These legends are full enough of the marvellous to make the book, with its weird illustrations, popular; but from the standpoint of folk-lore it must be pronounced a disappointment. The tales have lost their simplicity of diction, and the spontaneity which is their charm, through recasting into literary form, while the absence of any comparative treatment leaves us in the dark as to their historical relation. The book may, however, be read with advantage as supplemental to the collection of legends of the same unique and interesting people gathered by the Rev. Wentworth Webster, and published in 1877.

The History of the Forty Vezirs; or, the Story of the Forty Morns and Eves. Translated by E. J. W. GIBB, M.R.A.S. (George Redway.)—The history of this celebrated Turkish romance has been fully discussed by Mr. Clouston in his "Book of Sindibad," and we await with interest Messrs. Blackwood's publication of that author's forthcoming work on the profoundly interesting subject of the Migrations and Transformations of Popular Tales and Fictions. Meantime, we are grateful to Mr. Gibb for the present collection, which has for its well-worn and ungallant theme the weakness and frailties of woman. The framework of the story is the unjust accusations of a spiteful queen against her stepson, whom the king orders to be slain, but whose death is averted by the wisdom of the king's vezirs. Every night the crafty woman tells the king a story which incites him to slay the prince, and in the morning, when he is led forth to execution, a vezir tells a story which calms the king's anger. This goes on for "forty morns and eves," when the innocence of the prince is proved, and the queen's deceit exposed. Mr. Gibb's translation is pleasant to read, and an appendix of supplemental stories, together with tables of their place in the various texts, make his work a valuable addition to our materials for the study of Oriental romance.

Luck or Cunning? By SAMUEL BUTLER. (Trübner & Co.)—"Op. 8" is, according to its supplemental title, "an attempt to throw additional light upon the late Mr. Charles Darwin's Theory of Natural Selection." It should rather be described as an attempt to throw additional vitriol on Mr. Darwin's reputation as a man of science, and, still more, as a man of honour. Mr. Butler, as is well known, has an old-standing quarrel with Mr. Darwin, and with those who speak well of him, the grounds of which have been stated *ad nauseam* in Ops. 3 to 5, and in "Selections from Ops. 1–6." And we are at a loss to understand what purpose is served by this wearying reiteration of a charge which it seems to us was disproved in a letter from Mr. Darwin himself, published in Mr. Butler's "Op. 5," "Unconscious Memory." Certain parts of Mr. Butler's "Life and Habit," erratic as were its conclusions, made us expect great things from him, had he submitted his fantastic imagination to the rigidity of biological fact. But he has disappointed us, and we regret that so extremely clever a man, whose writings are full of good and true

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things pithily said, should obscure their goodness and truth under the verbiage of personalities, which disfigure this book even more than his earlier works.

Messrs. Longmans send us a choicely printed and cheap volume of selections from JEAN INGELOW, under the title of *Lyrical and Other Poems*. We are glad to have some old favourites in this compendious form. We have also on our table *The Anatomy of Negation*, by EDGAR SALTUS (Williams and Norgate); *The Parental Don't*; and *Bazaars and Christianity* (WALTER SCOTT); *Life after Death?* by F. W. NEWMAN (Trübner & Co.); Mr. COLE'S always instructive *Microscopical Studies; The Illustrated Handbook of Victoria* (Ferres, Melbourne); *A Froebel Reading Primer*, by A. C. BEALE (Sonnenschein & Co.); *The British Almanac and Companion for* 1887; *The Antiquarian*; *The Century Magazine*, the most valuable feature of which is the Life of President Lincoln, by "Pike Ballad" Colonel Hay and J. G. Nicolay; *Longman's Magazine*, in which Miss Orme fails to meet the powerful arguments of Dr. Richardson as to the necessity of woman, if she elects to do man's work, resigning the normal functions of maternity.

THE FACE OF THE SKY FOR JANUARY.

IN the present quiescent state of the solar surface the sun affords but scant interest to the observer with the telescope. He is in perigee—*i.e.*, the earth is at the nearest point in her orbit to him—at 8 P.M. on January 2. Hence at this date his disc is apparently larger than at any other time. The night sky is shown on map i. of "The Stars in their Seasons." Minima of that remarkable variable star Algol ("The Stars in their Seasons," map xii.) will happen at 6h. 36m. P.M. on January 1, at 11h. 29m. P.M. on the 18th, at 8h. 18m. P.M. on the 21st, and at 5h. 7m. P.M. on the 24th, and on other dates, when it will be unobservable by the ordinary amateur. Mercury is a morning star throughout January, and is, moreover, so very low down, and so close to the sun towards the end of the month as to be practically invisible. Venus is an evening star. During the earlier part of January she is, to all intents and purposes, invisible too; but towards the end of the month, on a perfectly clear evening, she may be caught after sunset glittering above the horizon in the S.W. by W. Mars is absolutely invisible. Jupiter is a morning star. As he does not rise until after 2h. 15m. A.M. at the beginning of January, nor until half an hour after midnight on the 31st, he can hardly yet be regarded as an object of observation for the ordinary amateur. Saturn, on the contrary, is admirably placed, coming, as he does, into opposition to the sun at 2 P.M. on the 9th. He is in fact visible all night long, and during the major part of it is most favourably placed, his meridian altitude in London exceeding 61°. The attentive observer will note the slight closing of his ring system, and that the south pole of the planet no longer falls within Cassini's division in the rings. Saturn is in Gemini ("The Stars in their Seasons," map ii.) to the south of Castor and Pollux. Towards the end of the month he will be in the same telescopic field as that well-known double star δ Geminorum. Uranus, as a morning star, will scarcely come into view for our purpose for the next month or two; but Neptune continues visible during all the earlier hours of the night. He is situated in a blank part of the sky, a little less than 6½° south of the Pleiades ("The Stars in their Seasons," map i.). The moon enters her first quarter 20·5 minutes after noon on the 2nd, and is full at 10h. 32·3m. on the night of the 9th. She enters her last quarter at 3h. 22m. P.M. on the 16th, and is new at 3h. 1·1m. in the early morning of the 24th. No less than fourteen occultations of fixed stars by the moon will occur at convenient hours for the amateur during the present month, in addition to others during the morning ones. On January 4, μ Ceti, a star of the 4th magnitude, will disappear at the moon's dark limb at 8h. 28m. P.M. at an angle of 87° from her vertex. It will reappear at her bright limb at 9h. 33m. P.M. at a vertical angle of 348°. On the 5th *f* Tauri, another 4th magnitude star, will disappear at the dark limb of the moon at 5h. 21m. P.M. at a vertical angle of 48°, to reappear at her bright limb at 6h. 24m. P.M. at any angle from her vertex of 293°. On the 6th, 71 Tauri, of the 6th magnitude, will disappear at the dark limb of the moon at 6h. 50m. P.M. at an angle of 359° from her vertex. It will reappear at 7h. 7m. P.M. at her bright limb at a vertical angle of 334°. Later at 7h. 47m. P.M. θ^1 Tauri and θ^2 Tauri, both stars of the 4½th magnitude will disappear at the moon's dark limb at 7h. 47m. and 7h. 54m. P.M. respectively; the former at an angle of 68°, and the latter at one of 47° from her vertex; θ^1 Tauri will reappear at 9h. 2m. P.M., and θ^2 Tauri at 8h. 55m. P.M. at the bright limb; θ^1 at a vertical angle of 295°; θ^2 at one of 316°. Later, the 5th magnitude star B.A.C. 1391 will disappear at the dark limb of the moon at 9h. 2m. P.M. at an angle of 108° from her vertex, reappearing at her bright limb at 10h. 19m. P.M. at an angle from her vertex of 289°. Finally, the most important occultation of all on this prolific night will occur 17 minutes after midnight, at which hour Aldebaran will disappear at the dark limb at a vertical angle of 165°. It will reappear the next morning at 1h. 15m. at the bright limb, at an angle of 283° from the moon's vertex. The student should endeavour particularly to observe this occultation both at the disappearance and reappearance of the star, inasmuch as the curious phenomena of projection on the moon's disc, &c., during occultations have been nearly always recorded in connection with this particular one. On the 7th, 115 Tauri, a 6th magnitude star, will disappear at the dark limb at 8h. 53m. P.M., at a vertical angle of 95°, reappearing at the bright limb at 10h. 6m. P.M., at an angle of 261° from the moon's vertex. On the 9th, B.A.C. 2432, of the 6½th magnitude, will disappear at 7h. 6m. P.M., at an angle from the vertex of the moon of 106°. It will reappear at 7h. 40m. P.M., at a vertical angle of 175°. The disappearance will in reality occur at the dark limb of the moon, but she will be so nearly full that the effect will be that both limbs will appear to be bright at disappearance as well as at reappearance. On the 12th, 45 Leonis, a star of the 6th magnitude, will disappear at the moon's bright limb at 9h. 11m. P.M., at a vertical angle of 83°; to reappear at her dark limb at 9h. 50m. P.M., at an angle of 171° from her vertex. Later on, ρ Leonis, a 4th magnitude star, will disappear at the bright limb at 11h. 29m. P.M., at an angle of 61° from the lunar vertex. It will reappear 30 minutes after midnight at the dark limb, at a vertical angle of 199°. Passing over several occultations which happen during the morning hours, we come to the 28th, on which date 4 Ceti, a 6th magnitude star, will disappear at the dark limb of the moon at 7h. 16m. P.M. at an angle of 179° from her vertex. It will reappear at her bright limb at 8h. 13m. P.M., at an angle from her vertex of 296°. Subsequently, 5 Ceti, another 6th magnitude star, will disappear at the dark limb at 7h. 42m. P.M., at an angle of 196° from her vertex, to reappear at 8h. 26m. P.M. at a vertical angle of 281°. Finally, on the 30th, ν Piscium, a star of the 4½th magnitude, will disappear at the moon's dark limb at 9h. 24m. P.M., at a vertical angle of 185°, and will reappear at the bright limb at 10h. 15m. P.M., at an angle of 289° from the vertex of the moon. At noon on January 1 the moon is in Pisces ("The Seasons Pictured," plate xxii.); and about 6 o'clock in the evening she enters the extreme confines of Cetus, whence she re-emerges into Pisces at about the same hour on the 2nd. She travels through Pisces until 10 P.M. on the 3rd, when she arrives at the most northerly outlier of Cetus, and again enters that constellation. When she finally quits it at noon on the 4th it is to pass into Aries. Her passage through the last-named constellation occupies her until 4 P.M. on the 5th, at which hour she crosses into Taurus ("The Seasons Pictured," plate xxiii.). In her journey across Taurus she arrives at 8 A.M. on the 8th on the boundary of the narrow northern part of Orion. When by 7 o'clock the same evening she has traversed this, it is to pass into Gemini ("The Seasons Pictured," plate xxiv.). She is travelling across Gemini until 9 A.M. on the 10th, when she crosses into Cancer. It takes her until 7h. 30m. P.M. on the 11th to traverse the last-named constellation, which at that hour she quits for Leo. Here she remains until 5h. 30m. A.M. on the 14th, and then enters Virgo ("The Seasons Pictured," plate xxv.). Her passage across Virgo occupies until 8h. A.M. on the 17th, when she crosses the boundary into Libra ("The Seasons Pictured," plate xxvi.). In her journey through the constellation last named she arrives, at 3h. A.M. on the 19th, at the edge of the narrow northern spike of Scorpio. Nine hours and a half later she has passed over this and entered Ophiuchus. She leaves Ophiuchus for Sagittarius at 7h. A.M. on the 21st, and Sagittarius, in turn, for Capricornus, at 6h. P.M. on the 23rd ("The Seasons Pictured," plate xxi.). She is travelling through Capricornus until 9h. P.M. on the 24th, at which hour she enters Aquarius, a constellation which she never leaves until 10h. P.M. on the 27th; to pass into Pisces ("The Seasons Pictured," plate xxii.) In her journey through this great straggling constellation she (just as at the beginning of the month) passes into a part of Cetus at midnight on the 28th, to re-enter Pisces at 2h. A.M. on the 30th. At 5h. 30 A.M. on the 31st she also, for the second time this month, re-enters a part of Cetus, to come out in Aries at 11h. P.M. on the 31st ("The Seasons Pictured," plate xxiii.). She is, of course, in Aries when our notes terminate.

Our Whist Column.

BY "FIVE OF CLUBS."

MATHEWS ON WHIST.

(*Continued from page* 22.)

BEFORE you play a card, sort your hand carefully, look at the trump card, and consider the score of the game and strength of your hand. Form your plan on the probable situation of the cards, being prepared, however, to change the plan should anything fall to indicate a different one. After deciding on your plan, never look at your hand till it is your turn to play. Without attention to the board, no maxims in practice can ever make a tolerable whist-player.

Never lead a card without a reason. It is better to have a wrong reason than to fall into a habit of playing at random.

At the commencement of a game, if you have a good hand, or if your adversaries are considerably advanced in the score, play a bold game; otherwise a more cautious one. [This rule requires some modification. If you have a good hand and you and your partner are considerably advanced in the score, it is better to play a cautious game, because the object of a bold game is to get many tricks, and you want but few—on the supposition—to win. Again, if you have a poor hand, and your adversaries are considerably advanced in the score, your first object should be to save the game, which requires cautious play, directed rather to securing the odd trick, or so many tricks as may be necessary to prevent the enemy going out, than to secure a winning game. The rule should rather run, then—If the enemy are well advanced in the score, and you have a good hand, so that there is little danger of losing, play a bold game; but if your hand is bad and the enemy well advanced, play more cautiously. This I imagine is what Mathews really meant, as otherwise his rule as a whole (with its perplexing "if otherwise") is altogether misleading and barely intelligible.]

The best leads are from sequences of three cards or more. If you have none lead [in general] from your most numerous suit. It is seldom right to lead from a suit in which you have a tenace. With Ace, Queen, &c., of one suit, King, Knave, &c., of a second, and the third a weak one, the best play is to lead from the last. [This is no longer the opinion of the most experienced whist-players, who under such circumstances would lead a small card from the lowest suit, or the Ace if holding five in that suit.] If strong in trumps, lead rather from a suit headed by a King than a Queen. But with three or four small trumps, I should prefer leading from a single card to opening a long weak suit.

It is hardly necessary to point out that while the old school seldom led a singleton, except with length in trumps, regarding it as a dangerous lead, the modern school objects to the singleton lead under nearly all circumstances. But the modern school would be more in sympathy with Mathews than with the old school, for Mathews's idea clearly is that with a few small trumps and a bad hand you can lose nothing by ruffing if you get the chance, and may make a trick or two, or possibly find your partner able to join in a cross-ruff. The chief danger, that which has practically divided the modern school against the singleton lead, even under these comparatively favourable conditions, is this—the chances when you are weak in trumps and in hand are that the enemy's combined strength surpasses your partner's, both in trumps and in the suit in which you hold a singleton; if this be the case, your singleton lead shows them just what to do to make a long score. They extract trumps, use the suit in which they have length and strength effectively against you and your partner, and probably render any other good cards he may have in other suits useless to him, while you are powerless to help him. By keeping back your singleton, you keep back also the knowledge necessary to put them in the way of thus using their strength for your destruction.

Another case in which Mathews considers that you may lead a singleton seems less obviously objectionable.

As I have ventured to recommend occasional deviations from what is considered one of the classic maxims, advising the lead from a single card without that strength in trumps hitherto [he refers, of course, to the oldest of old schools] judged indispensable to justify it, I give the reasons that influence my opinion in favour of this practice, with those generally alleged against it, leaving the reader to determine between them. Two objections are made, which, it cannot be denied, may be, and are at times, justified by the event. The first is that, if your partner has the King of the suit guarded, and the Ace behind it, he loses it; which would not be the case if the lead came from the adversary. The second and most material is, that your partner, if he wins the trick, may lead out trumps, on the supposition that it is your strong suit; or the adversaries may lead out trumps, suspecting your purpose. On the other hand, the constant and certain advantages are the preservation of the tenace in the two other suits—which I suppose you to have [this, however, was not what his prior advice as worded would have suggested]—and the probable one of making your small trumps, which you would not otherwise do. If the leader has four small trumps; Ace, Queen, &c., of the second suit; King, Knave, &c., of a third; and a single card of the fourth, I am of opinion that the chance of winning by leading the single card is much greater than that of losing tricks; and I appeal to those who are in the habit of attending whist-tables whether they do not frequently see the players who proceed more exactly according to the maxims of Hoyle, &c., after losing the game, try to demonstrate that this ought not to have happened, and that they have been vanquished by the bad, not by the good, play of their adversaries. I do not recommend, in general, leading from single cards, unless very strong in trumps; but, with such cards as I have mentioned, I am convinced it may occasionally be done with very great, though not with certain, advantage.

Of course the case here considered is very different from that which had before been mentioned. It may be admitted that the singleton lead from such a hand would be safe, or even in playing for the odd trick, good policy. The fault of the play would reside not in its undue daring, but in its undue caution. With such a hand a trump lead would be the best. You have necessarily a long suit, if not two, and both well guarded. Should your partner not be strong in trumps, or well guarded in your singleton suit, you remain with three, or at the least with two, trumps wherewith to ruff the singleton suit—and you have all the better chance of doing this, that the enemy, noting your trump lead, will not be anxious to extract trumps. But the chances are that either your partner has strength in trumps, or he has at least some strength in your short suit: in either case your lead is a safe one. Should he have any strength in trumps, and two rounds be taken out, you and he have an excellent chance of making a good score.

[We shall see presently under what conditions Mathews recommends the trump lead; but now pass on to consider his detailed advice in regard to the leads.]

With Ace, King, Knave, and three small trumps, play out the Ace and King; but with only two small trumps, play the King, and wait for the finesse of the Knave. In other suits, without great strength in trumps, or with the chance of making a particular point [if the finesse is successful] do not wait for the finesse. [Mathews here, and in the next rule, advises the Ace lead first, as a general rule—for the lead of the King is only authorised by him when you propose to wait for the finesse, and when, therefore, it is necessary to show your partner you hold the leading card, and wish the suit led to you. He evidently considers that in plain suits, when you do not wish the suit returned, it is better to lead the Ace first.]

With Ace, King, and five others, lead the Ace in all suits; but with four or less, lead the lowest in trumps. [The rule is only changed in our time, in that the King is played from the head sequence in the former case, and the fourth best, or penultimate, in the latter, except by the staunch opponents of penultimate and American leads. We still adopt the point of strategy, leading a small card from Ace, King, and fewer than five small cards in trumps.]

With Ace, Queen, Knave, &c., lead the Ace in all suits. With Ace, Queen, ten, and others, in trumps lead a small one; but in plain suits, with Ace, Queen, ten, and two others, lead the Ace unless very strong in trumps. [Mathews so words the rule as to leave it in doubt whether he means in the last case Ace, Queen, ten, and three others, or Ace, Queen, and three small ones. Probably his rule was the same as ours—Ace first from Ace, Queen, and three small ones; only he notes the exception, which most of our modern books fail to mention, that with great strength in trumps you should lead a small card in the plain suit, whether you open the plain suit first or after taking out a round or two in trumps.]

With Ace, Knave, and small ones, lead the lowest in trumps. In other suits, with Ace, Knave, and more than two small ones, lead the Ace, unless very strong in trumps. [Sound advice, both as to rule and exception. It is clear my reading of the preceding rule is correct.]

With Ace and four small ones, lead the lowest in trumps; the Ace in plain suits, unless you are very strong in trumps. [With Ace and five small ones, lead a small card in trumps; but with six small cards, lead the Ace.]

(*To be continued.*)

Our Chess Column.

BY "MEPHISTO."

REVERENCE for the past is not a characteristic trait of the present generation of chess players. We may, however, always find something interesting, to reward us for our pains in turning over the sere and yellow leaves of the chess literature of old. In looking backward for inspiration for the New Year's chess article, I made a virtue of necessity, which I am pleased to call reverence for the past. The necessity may, however, be practically explained by a remarkable falling off in the production of good chess in this country. This falling off can be accounted for partly by a large decrease in first-class play, owing to circumstances affecting some individuals who formerly played good chess professionally. Going still deeper into the causes of this failing, we are bound to come to the conclusion that the enthusiasm for chess which animated many of the great players of the past, and which, in connection with patient and laborious study, produced such fine results, is gradually disappearing. The pressure on man's mind is far more severe than it used to be formerly, and the demand on his physical energy in the struggle for life is so much greater, and as a man must possess an easy and free mind, and plenty of leisure time to pursue chess ardently, I have grave doubts whether we shall in this or the next generation find such noble votaries of chess as Philidor, Labourdonais, Staunton, MacDonnell, Bilguer, Van der Lasa, Andersen, Paulsen, Morphy, &c.

In looking over some curious examples of old compositions, I came across a very interesting and useful position, composed by a Cambridge man, given in the diagram below. In this problem a mate can be forced by any one of White's five pieces. There can be no more useful exercise than an attempt at solving this problem. In order to do so, we must conceive or find five different mating positions in this one problem, in itself an excellent practice; for, unless we first discover the possibility of a mate being given, we can never solve any problem; how to mate follows then of itself.

Here we have an excellent example, showing the power of pieces in certain positions, and their influence on the whole. No doubt good practice for problem composers who put pieces on the board, to make up a position with a light heart, without calculating other effects which they produce, creating double solutions, duals, &c.

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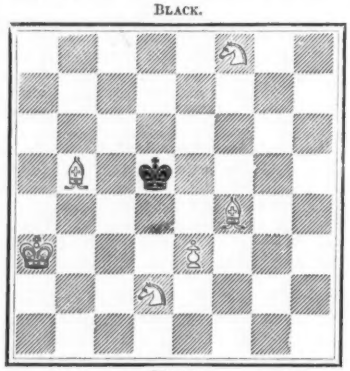

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The problem is—

1. White to mate in 4 moves with the Kt on B8.
2. " " 5 " " KB.
3. " " 5 " " P.
4. " " 6 " " Kt on Q2.
5. " " 8 " " QB.

I presume that the reader will make a prolonged effort to solve this problem. For the benefit and instruction of those not sufficiently acquainted with the method how to solve a problem, I hereby work out the solution, as a useful guide for future efforts in the same direction.

Now in order to find out No. 1, which is the most difficult, we must suppose that we do not know that the mate has to be given by the Kt on B8, but we must treat it simply as a four-mover. First of all we have to take a good survey of the relative position of the White pieces, and then of the Black K. We find the K can only move to B4, and in an open position like this it may safely be taken for granted that in order to mate in four moves, the White cannot afford to give Black much liberty after Black playing K to B4; we have also to provide against K × B and K to Kt3, which we obviously cannot allow. We see, therefore, that K to B4 is the move to counteract. We may have several tries at doing this. Kt to Q7 would not do, as that would open a still larger loophole for escape of the black K *viâ* K3, therefore we try 1. B to B7, K to B4. Now we must move the other B or protect him with 2. K to R4, K to Q4. But by looking at the position we find that we have not got more forward, for whether we move either Kt or P, the black K obtains more liberty. If we replace the position, therefore, we may attempt to cut off the retreat of the black K by 1. K to R4 and 2. K to R5; but here again we shall soon find that there is no mate possible in four moves. By making various efforts with the B's and the P, we shall also soon come to the conclusion that in order to mate in four moves the position must be disturbed as little as possible. There remains, therefore, but the Kt on Q2 available. We can undoubtedly cut off the K from B4 by Kt to Kt3, but then we allow K to K5. As we are, however, impressed with the conviction that we must prevent K to B4 if possible, we must look what we can do further after 1. Kt to Kt3, K to K5. It is certain we cannot allow Black's K to KB4 or KB6, and we see that 2. Kt to Q4 is the only move to prevent either; but as yet we have achieved nothing. Nevertheless, we are guided instinctively to make these moves, especially as the black K must now go back, and we know by experience that by so limiting the action of the K we are more likely to bring about a mating position. Feeling that in all probability we are on the right track, we must not easily be deterred, but seek to find a mating position. After 2. Kt to Q4, K to Q4 in looking for a mate, we soon find that if the white K were now on Kt4, we could mate by B to B6. Can we bring that about? No, for if 3. K to Kt4, K to K5, and there is no mate next move, although we can mate in 5 by 4. B to K2, K to Q4. 5. B to B3, mate. But then we must do it in four, and we feel that there cannot be any time for moving the K, therefore we replace the men and try again, nothing daunted. 1. Kt to Kt3, K to K5. 2. Kt to Q4, K to Q4. We see that the Kt on Q4 now protects the square on K6, which makes the Kt on B8 available. Supposing we try 3. Kt (B8) to K6, then K to K5, and there is no mate anywhere the same if 3. Kt (Q4) to K6, but there is still 3. Kt to Q7, then K to K5, and surely 4. Kt to B6 is mate.

Now this is a case where we could not see the mating position first, but where we had to weigh probabilities to lead us in the right direction, and then exhaust possibilities to find the solution, which is mostly the case with problems above three moves.

The other solutions are as follows:—

No. 2. To mate with KB in five moves:—

We have already found out in attempting to solve No. 1, namely, by 1. Kt to Kt3, K to K5. 2. Kt to Q4, K to Q4. 3. K to Kt4, K to K5. 4. B to R6, K to Q4. B to Kt7, mate. In this mate there are many duals; on the 4th move the B can move to three places or the Kt on B8 can make four different moves, after all of which the KB will be able to give mate. A mate can also be given by 3. Kt to Q7 or K6, K to K5. 4. K to Kt3 or Kt4, K to Q4. 5. B to B6, mate. There are also duals in the other solutions. The study of all these various duals will be useful exercise for anyone wishing to learn how to solve or construct a problem.

No. 3. To mate with the P in five moves:—

1. K to R4, K to B4. 2. B to B7, K to Q4. 3. B to Q7, K to B4. 4. Kt to K6 (ch), K to Q4. 5. P to K4, mate.

No. 4. To mate with the Kt on Q2 in six moves:—

1. K to R4, K to B4. 2. K to R5, K to Q4. 3. B to B7, K to B4. 4. Kt to K6 (ch), K to Q4. 5. Kt to B4 (ch), K to B4. 6. Kt on Q2 mates.

No. 5. To mate in eight moves with QB:—

1. K to R4, K to B4. 2. K to R5, K to Q4. 3. B to Q7, K to B4. 4. Kt to K6 (ch), K to Q4. 5. Kt to B7 (ch), K to B4. 6. Kt to Kt5, K to Q4. 7. P to K4 (ch), K to B4. 8. B mates.

J. C.—You are right. In KNOWLEDGE for November, Diagram p. 24, the Black Queen should be on Black's QR square, not on QR8.

CONTENTS OF No. 14.

	PAGE
The Cloudberry	25
The Story of Creation: a Plain Account of Evolution. By Edward Clodd	27
Martingales; or, Sure (?) Gambling Systems	29
Indian Myths about Thunder. By "Stella Occidens"	32
A One-Scale Atlas	34
The Southern Skies	35
Notes on Americanisms. By Richard A. Proctor	38
Our Puzzles	39
The Whist Players' Puzzles	40
Gossip. By Richard A. Proctor	41
Reviews	44
Our Chess Column. By "Mephisto"	47
Whist. By "Five of Clubs"	48
The Face of the Sky for December. By F.R.A.S.	48